Series 3730
Electropneumatic Positioner
Type 3730-4

with PROFIBUS-PA communication

Fig. 1 · Type 3730-4

Mounting and Operating Instructions

EB 8384-4 EN

Firmware version K 1.13/R 1.46

Edition July 2008

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Modifications to positioner firmware compared to the previous version	
Communication	
old	new
K 1.00	**K 1.01**
	Internal modifications
K 1.01	**K 1.10**
	The FEATURE_SELECT parameter allows you to set whether an active diagnostic function is to be reported by a GOOD_FUNCTION_CHECK or a BAD_FUNCTION_CHECK (see page 144)
K 1.10	**K 1.11**
	– More trigger conditions in the data logger (see page 144) – More additional functions (FEATURE_SELECT) (see page 144) – The limits of the discrete valve position (POS_D_LIMIT_LOW, POS_D_LIMIT_UP) can now be defined as required (see page 75)
K 1.11	**K 1.12**
	Resetting the identification parameters resets all the parameters saved in the controller. The parameters saved in the controller are, however, not reset when just the start-up parameters are reset (see page 134).
K 1.11	**K 1.13**
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R 1.45	**R 1.46**
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General safety instructions

- *The positioner may only be mounted, started up or operated 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 relevant 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 on Servicing explosion-protected versions.
- *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 level, it must be restricted by means of a suitable supply pressure reducing station.*
  Do not operate the positioner with the back of it/exhaust air opening facing upwards. Never seal the exhaust air opening when the positioner is mounted on site.
- *Proper shipping and appropriate storage are assumed.*

Note: *The device with a CE marking fulfils the requirements of the Directives 94/9/EC (ATEX) and 89/336/EEC (EMC).*
The declaration of conformity is available on request.

Positioner		**Type 3730-4**	x	x	x	0	x	0	x	x	1	x	0	0	x	0	x	x
With LCD and autotune, PROFIBUS-PA																		
Explosion protection																		
None			0															
⟨Ex⟩ II 2 G EEx ia IIC T6 and ⟨Ex⟩ II 2 D IP 65 T 80 °C (ATEX)			1															
CSA/FM intrinsically safe / non incendive			3															
⟨Ex⟩ II 3 G EEx nA II T6, ⟨Ex⟩ II 3 G EEx nL IIC T6 and ⟨Ex⟩ II 3 D IP 65 T 80 °C acc. to ATEX			8															
Additional equipment																		
Inductive limit switch	Without			0														
	1 x Type SJ2-SN			1														
Solenoid valve	Without				0													
	With, 24 V DC				4													
External position sensor	Without						0											
	With			0			1		0				0					
Binary input	Without								0									
	Floating contact						0		1									
Diagnostics																		
EXPERT (standard)										1								
EXPERT+ (extended diagnostics)										2								
Housing material																		
Aluminum (standard)													0					
Stainless steel 1.4581							0						1					
Special application																		
None															0			
Device compatible with paint															1			
Exhaust connection with ¼-18 NPT thread				0	0		0		0						2			
Special version																		
None																0	0	0
NEPSI Ex ia			1													0	0	9
NEPSI Ex nL/nA			8													0	1	0
IECEx			1													0	1	2

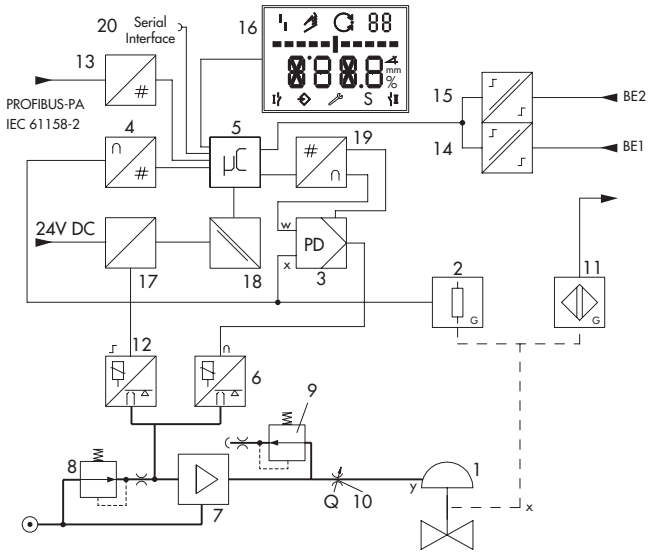
1 Design and principle of operation

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 consists of a travel sensor system proportional to resistance, an analog i/p converter with a downstream booster and the electronics unit with microcontroller.

When a deviation occurs, the actuator is pressurized or vented. If required, the changes in the signal pressure can be slowed down by a connectable Q restriction. The signal pressure supplied to the actuator can be limited by software or on site to 1.4, 2.4 or 3.7 bar.

A constant air stream to the atmosphere is created by the flow regulator (9) with a fixed set point. The air stream is used to purge the inside of the housing as well as to optimize the air capacity booster. The i/p module (6) is supplied with a constant upstream pressure by the pressure regulator (8) to make it independent of the supply air pressure.



1 Control valve
2 Travel sensor
3 PD controller
4 A/D converter
5 Microcontroller
6 i/p converter
7 Air capacity booster
8 Pressure regulator
9 Flow regulator
10 Volume restriction
11* Inductive limit switch
12* Solenoid valve
13 IEC 61158-2 interface module
14 Binary input 1 (voltage input)
15 Binary input 2 (for floating contact)
16 Display
17* Solenoid valve control
18 Galvanic isolation
19 D/A converter
20 Serial interface (SSP)

* Optional

Fig. 2 · Functional diagram

The positioner communicates and is powered using IEC 61158-2 transmission technology conforming to PROFIBUS-PA specification.

As a standard feature, the positioner comes with a binary input for DC voltage signals to signalize process information over the PROFIBUS-PA.

1.1 Additional equipment

Version with solenoid valve

If the operating voltage for the solenoid valve (12) fails, the supply pressure for the i/p module is vented to the atmosphere. The positioner can no longer operate and the control valve moves to the fail-safe position determined by the actuator, independent of the reference variable.

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).

Version with inductive limit switch

The rotary shaft of the positioner carries an adjustable tag which actuates the installed proximity switch.

Version with binary contact

All positioners are fitted with a binary input for DC voltage signals over which process information can be issued over the PROFIBUS-PA network.
Another optional binary input is an active input powered by the positioner to connect a floating contact. Its switching condition can also be issued over the PROFIBUS-PA network.

Version with 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 via cable and piping for air (only without inductive limit switch).

1.2 Communication

The positioner is completely controlled over the digital signal transmission implemented complying with PROFIBUS-PA Profile B as per DIN EN 50170 and DIN 19245 Part 4.

Data are transmitted as bit-synchronous current modulation at a rate of 31.25 kbit/s over twisted-pair cables conforming to IEC 61158-2.

Usually, the positioner settings are made on a computer which is connected to one or more positioners linked over a segment coupler to the PROFIBUS segment of the computer.

Configuration using TROVIS-VIEW software

The positioner can be configured using TROVIS-VIEW Configuration and Operator Interface software.
The positioner is equipped with an additional digital **SERIAL INTERFACE** to allow a computer to be connected over an adapter cable from the RS-232 interface 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.

1.3 Technical data

Type 3730-4 Positioner with PROFIBUS-PA communication	
Rated travel, adjustable	Direct attachment to Type 3277: 3.6 to 30 mm Attachment acc. to IEC 60534-6 (NAMUR): 3.6 to 200 mm Attachment to rotary actuators (VDI/VDE 3865): 24° to 100°
Travel range	Adjustable within the initialized travel/angle of rotation; travel can be restricted to 1/5 at the maximum
Bus connection	Fieldbus interface acc. to IEC 61158-2 bus-powered Field device acc. to FISCO (Fieldbus Intrinsically Safe Concept)
Communication	
Fieldbus	Data transmission as per PROFIBUS-PA specification, Profile Class B acc. to EN 50170 and DIN 19245 Part 4 DTM file acc. to Specification 1.2, suitable for integration of the device into frame-work applications that support the FDT/DTM concept. Other integrations, e.g. PDM, possible
Local	Over SAMSON SSP interface and serial interface adapter
Software requirements (SSP)	SAMSON TROVIS-VIEW with database module 3730-4
Perm. operating voltage	9 to 32 V DC, power supply over bus line · The limits specified in the EC Type Examination Certificate additionally apply for explosion-protected devices
Max. operating current	15 mA
Add. current in case of fault	0 mA
Supply air Air quality acc. to ISO 8573-1 Edition 2001:	Supply pressure from 1.4 to 7 bar (20 to 105 psi) Max. particle size and density: Class 4; Oil content: Class 3; Moisture and water: Class 3; Pressure dew point: At least 10 K beneath the lowest amb. temp. to be expected
Signal pressure (output)	0 bar up to supply pressure, limitable to 1.4/2.4/3.7 ±0.2 bar via software
Characteristic	Linear/equal percentage/reverse equal percentage · User-defined (over operating software and communication) · Butterfly valve linear/equal percentage · Rotary plug valve linear/equal percentage · Segmented ball valve linear/equal percentage Deviation from terminal-based conformity ≤ 1 %
Hysteresis	≤ 0.3 %
Sensitivity	≤ 0.1 %
Direction of action	Reversible
Air consumption	Independent from supply pressure < 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

Type 3730-4 Positioner with PROFIBUS-PA communication	
Permissible ambient temperature	–40 to +80 °C The limits in the EC Type Examination Certificate additionally apply 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
Electromagn. compatibility	Complying with EN 61000-6-2, EN 61000-6-3 and NAMUR Recommendation NE 21
Explosion protection FM approval: CSA approval: IECEx:	⟨Ex⟩ II 2 G EEx ia IIC T6 / II 2 D IP 65 T 80 °C ⟨Ex⟩ II 3 G EEx nA II T6 / II 3 G EEx nL IIC T6 / II 3 D IP 65 T 80 °C Intrinsically safe; Class I, II, III; Div. 1, Groups A-G; Class I, Zone 0, AEx ia IIC Non incendive; Class I, Div. 2, Groups A, B, C, D; Class II, Div. 2, Groups F, G, Type 4X Ex ia IIC T6; Class II, Div. 1, Groups E, F, G; Type 4 Enclosure Ex nA IIC T6; Class I, Div. 2, Groups A, B, C, D; Class II, Groups E, F, G; Type 4 Enclosure Ex ia IIC T6
Electrical connection	One M20 x 1.5 cable gland, for clamping range 6 to 12 mm · Second additional threaded M20 x 1.5 hole · Screw terminals for 0.2 to 2.5 mm² wire cross-section
Degree of protection	IP 66 / NEMA 4X
Implementation in safety-related systems in compliance with IEC 61508/SIL	Probability of failure on demand of safety functions PFD < 2.8 x 10^{-7} for a confidence level of 95 %.The safe failure fraction (SFF) according to Table A1 in IEC 61508-2 is greater or equal to 0.99. The valves are therefore suitable for implementation in safety-related systems with a hardware fault tolerance of 1 or 2 up to and including SIL 4.
Binary input 1	
Input	0 to 30 V DC reverse polarity protection, static destruction limit 40 V / 5.8 mA, current consumption 3.5 mA at 24 V, galvanically isolated
Signal	Signal "1" at Ue > 5 V Signal "0" at Ue < 3 V
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	Nickel-plated brass, M20x1.5
Weight	Approx. 1.0 kg

Options for Type 3730-4 Positioner with PROFIBUS-PA communication	
Binary contact 2 for floating contact	
Switching input	R < 100 Ω, contact load 100 mA, static destruction limit 20 V / 5.8 mA, galvanically isolated
Solenoid valve	Approval acc. to IEC 61508/SIL
Input	24 V DC, max. 40 V, reverse polarity protection, static destruction limit 40 V Current consumption $I = \frac{U - 5.7\ V}{3840\ \Omega}$ (corresponding to 4.8 mA at 24 V/114 mW)
Signal	Signal "0" no pick-up ≤ 15 V · Signal "1" safe pick-up >19 V
Service life	>5 x 10^6 switching cycles
K_V coefficient	0.15
Implementation in safety-related systems in compliance with IEC 61508/SIL	Same as positioner pneumatics
Inductive limit switch	
Type SJ 2SN Proximity Switch	For connection to switching amplifier acc. to EN 60947-5-6
External position sensor	
Travel	Same as Type 3730 Positioner
Cable	10 m with M12x1 connector, designed for continuous flexing, flame retardant acc. to VDE 0472, resistant to oils, lubricants and coolants as well as other corrosive media
Perm. ambient temperature	–60 to +105 °C
Vibration immunity	Up to 10 g in the range between 10 and 2000 Hz
Degree of protection	IP 67

2 Attachment to the control valve – Mounting parts and accessories

The positioner can be attached either directly to a SAMSON Type 3277 Actuator or according to IEC 60534-6 (NAMUR) to control valves with cast yokes or rod-type yokes as well as to rotary actuators according to VDI/VDE 3845.

For attachment to the various actuators, corresponding mounting parts and accessories are required. These are listed with their order numbers in Tables 1 to 5.

On attaching the positioner, it is important to observe the assignment between lever and pin position according to the travels listed in the travel tables.

The tables show the maximum adjustment range at the positioner. The travel that can be implemented at the valve is restricted by the pin position used and additionally by the actuator spring compression required.

The positioner is standard equipped with the lever **M** (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.

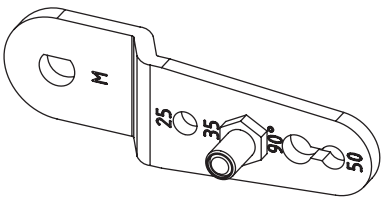


Fig. 3 · Lever M with pin position 35

Travel table for direct attachment to Type 3277 Actuator						
Type 3277-5 and 3277 Actuators	Actuator size cm²	Rated travel mm	Adjustment range at positioner Min.	Travel Max.	Required lever	Assigned pin position
	120	7.5	5.0	25	M	25
	120/240/350	15	7.0	35.0	M	35
	700	30	10.0	50.0	M	50

Travel table for attachment according to IEC 60534-6 (NAMUR)						
SAMSON valves			Other valves/actuators		Required lever	Assigned pin position
	cm²	Rated travel mm	Min.	Travel Max.		
Type 3271 Actuator	60 and 120 with Type 3510 Valve	7.5	3.6	18.0	S	17
	120	7.5	5.0	25.0	M	25
	120/240/350	15	7.0	35.0	M	35
	700	7.5				
	700	15 and 30	10.0	50.0	M	50
	1400/2800	30	14.0	70.0	L	70
	1400/2800	60	20.0	100.0	L	100
	1400/2800	120	40.0	200.0	XL	200
Rotary actuators			Opening angle 24 to 100°		M	90°

Table 1	Direct attachment to Type 3277-5 Actuator, see Fig. 4		Order no.
Mounting parts	For actuators with 120 cm² effective diaphragm area		1400-7452
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 for additional attachment of a solenoid valve G 1/8 Connecting plate (old) for Actuator Type 3277-5xxxxxx.**00** (old) 1/8 NPT		1400-6820 1400-6821
	Connecting plate **new** for Actuator Type 3277-5xxxxxx.**01** (new)		1400-6823
	***Note**: Only new switchover and connecting plates can be used with new actuators (Index 01). Old and new plates are not interchangeable.*		
Accessories for the positioner	Connecting plate (6)	G ¼: 1400-7461	¼ NPT: 1400-7462
	or 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./Bs: 1400-6950	St. st./St. st.: 1400-6951
Table 2	Direct attachment to Type 3277 Actuator, see Fig. 5		
Accessories	Mounting parts for actuators with 240, 350 and 700 cm²		1400-7453
	Required piping with screw fittings for "Actuator stem retracts" or when the top diaphragm chamber is filled with air	cm² Steel Stainless steel 240 1400-6444 1400-6445 350 1400-6446 1400-6447 700 1400-6448 1400-6449	
	Connection block with seals and screw	G ¼: 1400-8811	¼ NPT: 1400-8812
	Pressure gauge mounting kit up to max. 6 bar (output/supply)	St.st./Bs: 1400-6950	St.st/St.st.: 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, see Fig. 6		
Travel in mm	Lever	For actuators	Order no.
7.5	S	Type 3271-5 Actuator with 60/120 cm² on Type 3510 Valve, see Fig. 7	1400-7457
5 to 50	Without (Lever M is mounted on basic model)	Actuators from other manufacturers and Type 3271 with 120 to 700 cm²	1400-7454
14 to 100	L	Actuators from other manufacturers and Type 3271, version 1400-60	1400-7455
40 to 200	XL	Actuators from other manufacturers and Type 3271, versions 1400-120 and 2800 cm² with 120 mm travel	1400-7456
30 or 60	L	Type 3271, version 1400-120 and 2800 cm² with 30/60 mm travel	1400-7466
Mounting brackets for Emerson and Masoneilan linear actuators In addition, a mounting kit acc. to IEC 60534-6 is required depending on the travel. See row above.			1400-6771

Accessories	Connecting plate	G ¼: 1400-7461 ¼ NPT : 1400-7462
	or pressure gauge bracket (7)	G ¼: 1400-7458 ¼ NPT: 1400-7459
	Pressure gauge mounting kit up to max. 6 bar (output/supply)	St.st./Bs: 1400-6950 St.st./St.st.: 1400-6951

Table 4	Attachment to rotary actuators			
Mounting parts	With follower clamp and coupling wheel, CrNiMo steel bracket	VDI/VDE 3845 for all sizes of fixing level 2, see Figs. 8 + 9 for Type 3278 Actuator with 160/320 cm² for Camflex II		1400-7448 1400-7614 1400-9120
	VDI/VDE 3845 for all sizes of fixing level 2, heavy-duty version			1400-9244
	Mounting parts for rotary actuators VDI/VDE 3845 (level 1), heavy-duty version			1400-9526
	SAMSON Type 3278 160 cm² and VETEC Types S160, R and M, heavy-duty version			1400-9245
	AIR TORQUE 10 000, heavy-duty version			1400-9542
Accessories	Connecting plate		G ¼: 1400-7461	¼ NPT: 1400-7462
	or pressure gauge bracket (7)		G ¼: 1400-7458	¼ NPT: 1400-7459
	Pressure gauge mounting kit up to max. 6 bar (output/supply)		St.st./Bs: 1400-6950	St.st./St.st: 1400-6951
Table 5	General accessories			
Accessories	Pneumatic reversing amplifier for double-acting actuators		G ¼ ¼ NPT	1079-1118 1079-1119
	Cable gland M20 x 1.5	Nickel-plated brass		1890-4875
	Adapter M 20 x 1.5 to ½ NPT, aluminum			0310-2149
	Retrofit kit for inductive limit switch 1x SJ 2-SN			1400-7460
	Cover plate with list of parameters and operating instructions		English (standard)	0190-5328
	EXPERT+ activation code (specify the serial number of the positioner on ordering this option)			1400-9318
	TROVIS-VIEW with device module 3730-4 (order no. 6661-1057)			1548111
	Serial interface adapter (SAMSON SSP interface - RS-232 port on computer)			1400-7700
	Isolated USB interface adapter (SAMSON SSP interface - USB port on computer)			1400-9740

2.1 Direct attachment

2.1.1 Type 3277-5 Actuator

Refer to Table 1 on page 16 for the required mounting parts as well as the accessories with their order numbers.
Note the travel table on page 15!

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 vent 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 connection. 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) in the groove of the positioner casing.
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. 18).
   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. During the installation make sure that the seal ring (10.1) is inserted in the bore of the cover plate.
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.

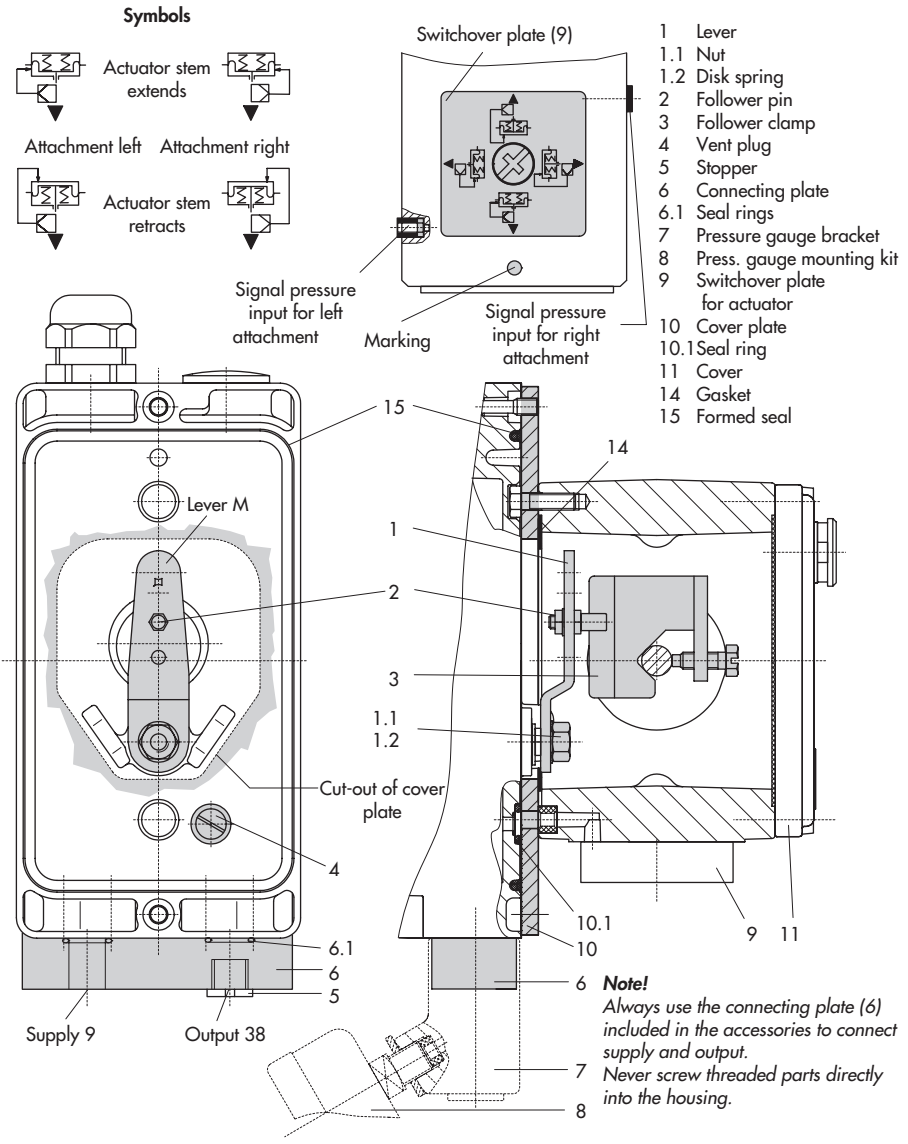


Fig. 4 · Direct attachment - Signal pressure connection for Type 3277-5 Actuator with 120 cm²

2.1.2 Type 3277 Actuator

Refer to Table 2 on page 16 or the required mounting parts as well as the accessories with their order numbers.
Note the travel table on page 15!

Actuators with 240 to 700 cm²

The positioner can be mounted either on the left or on the right side of the yoke. 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.

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 700 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 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 housing.
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. 18). 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.
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.

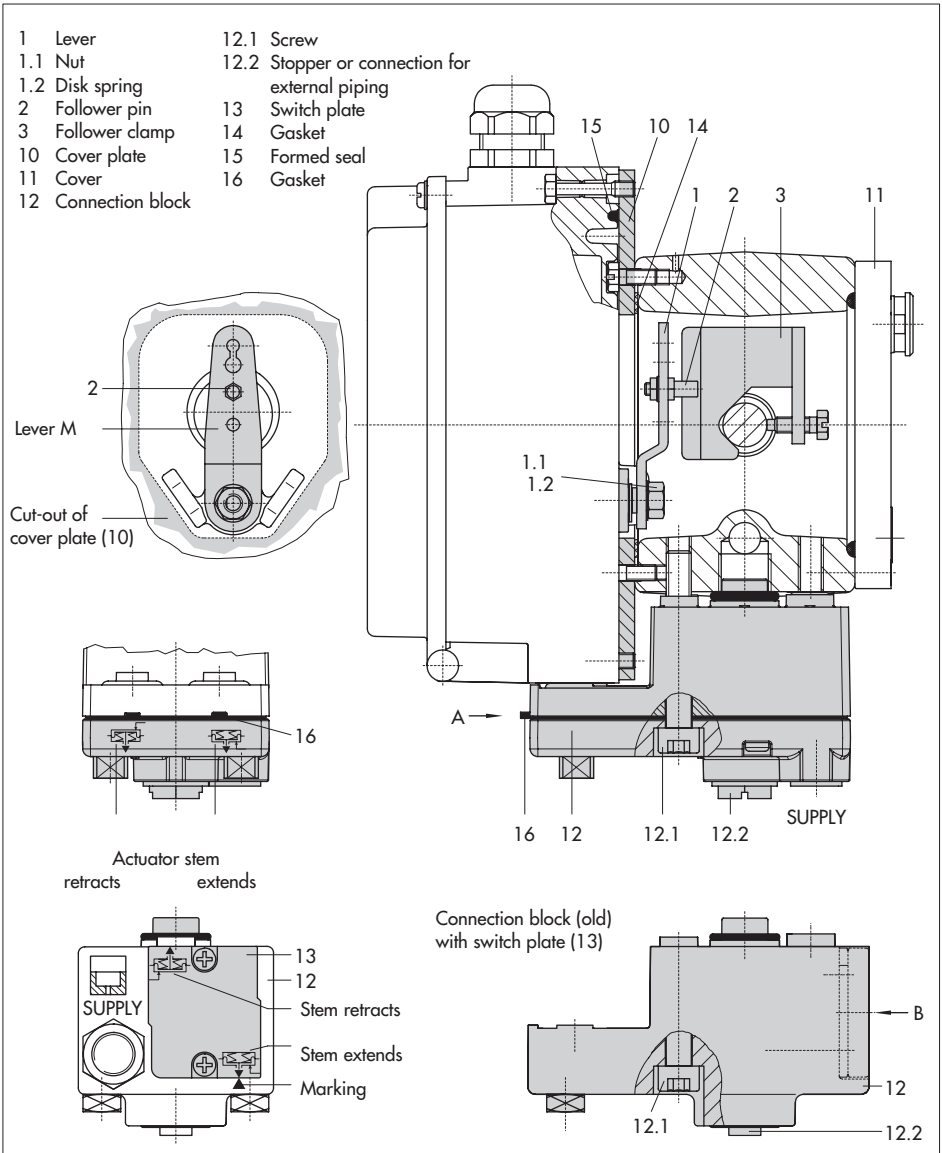


Fig. 5 · Direct attachment – Signal pressure connection for Type 3277 Actuator with 240, 350 and 700 cm²

2.2 Attachment according to IEC 60534-6

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

Refer to Table 3 on page 16 for the required mounting parts as well as the accessories with their order numbers.
Note the travel table on page 15!

1. 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 sizes 1400 cm² and 2800 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).

2. 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.
3. 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.
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 15.
   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:
5. 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.
6. 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.*

---

7. 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.

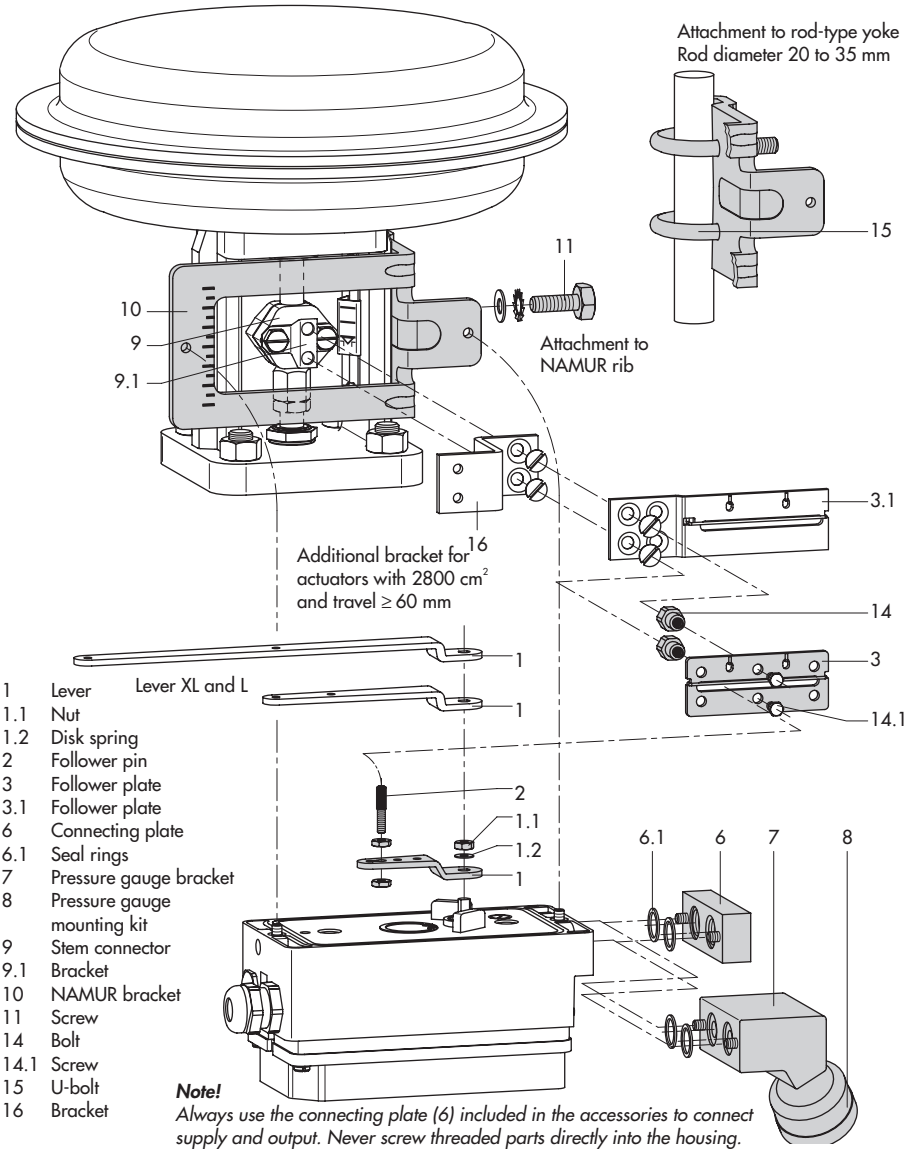


Fig. 6 · Attachment according to IEC 60534-6 (NAMUR)

2.3 Attachment to Type 3510 Micro-flow Valve

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

Refer to Table 3 on page 16 for the required mounting parts as well as the accessories with their order numbers.
Note the travel table on page 15!

1. Place clamp (3) on the valve stem connector, align at a right angle and screw tight.
2. Screw bracket (10) to the valve yoke using two screws (11).
3. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges to the positioner, making sure both seal rings (6.1) are seated properly.
4. Unscrew the standard installed lever **M** (1) including follower pin (2) from the positioner shaft.
5. Take lever **S** (1) and screw follower pin (2) in the bore for pin position **17**.
6. 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.
7. 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 hexagon screws.

1 Lever
1.1 Nut
1.2 Disk spring
2 Follower pin
3 Clamp
6 Connecting plate
6.1 Seal rings
7 Pressure gauge bracket
8 Pressure gauge mounting kit
10 Bracket
11 Screw

Note!
Always use the connecting plate (6) included in the accessories to connect supply and output.
Never screw threaded parts directly into the housing.

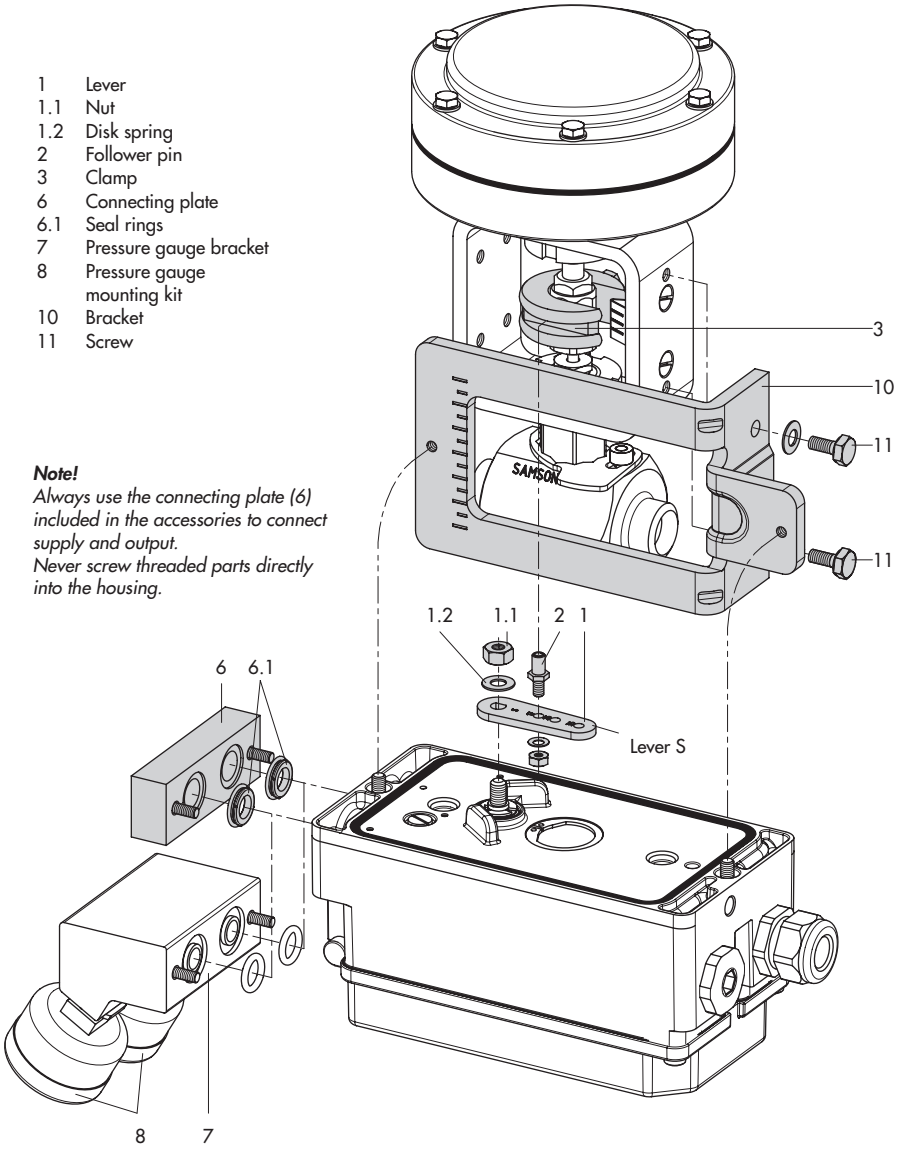


Fig. 7 · Attachment to Type 3510 Micro-flow Valve

2.4 Attachment to rotary actuators

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

Refer to Table 4 on page 17 for the required mounting parts as well as the accessories with their order numbers.

Prior to the attachment of the positioner to the SAMSON Type 3278 Rotary Actuator, you have to 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. 9 to align 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 2.5.
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. 9). 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.

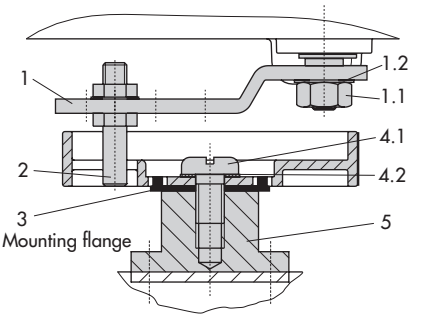
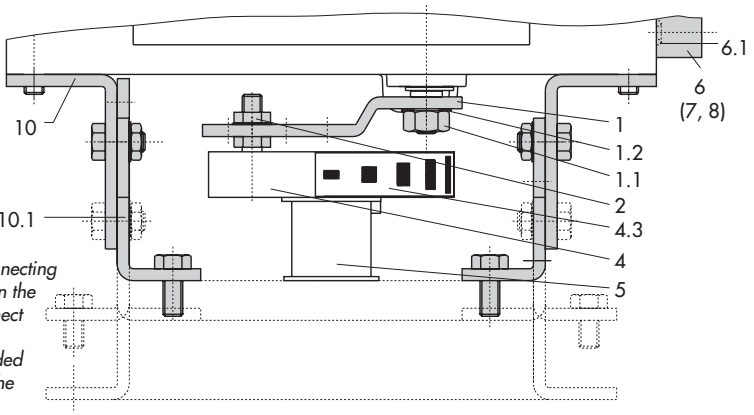
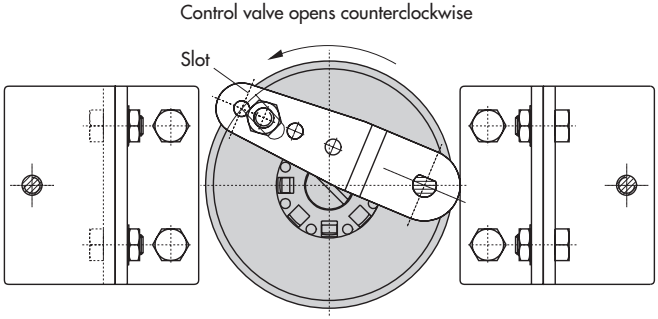


Fig. 8 · Mounting the coupling wheel with Type 3278



Note!
Always use the connecting plate (6) included in the accessories to connect supply and output. Never screw threaded parts directly into the housing.



Legends Figs. 8 + 9

1	Lever
1.1	Nut
1.2	Disk spring
2	Follower pin
3	Follower clamp (Fig. 8)
4	Coupling wheel
4.1	Screw
4.2	Disk spring
4.3	Scale plate
4.3	Scale plate
5	Actuator shaft Adapter for Type 3278
6	Connecting plate
6.1	Seal rings
7	Pressure gauge bracket
8	Pressure gauge mounting kit
10	Top pair of brackets
10.1	Bottom pair of brackets

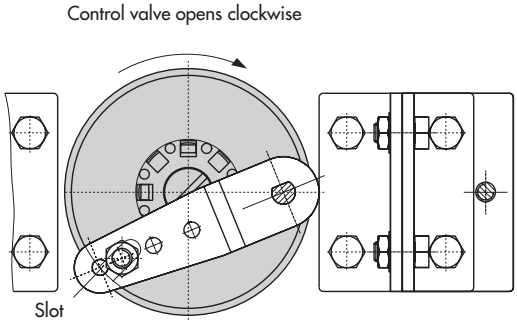


Fig. 9 · Attachment to rotary actuators

2.5 Reversing amplifier for double-acting actuators

For the use with double-acting actuators, the positioner must be fitted with a reversing amplifier. The reversing amplifier is listed as an accessory in the Table 5 on page 17.

The output signal pressure of the positioner is supplied at the output **A_1** of the reversing amplifier. An opposing pressure, which equals the required supply pressure when added to the pressure at **A_1**, is applied at output **A_2**.
The rule **A_1** + **A_2** = **Z** applies.

Mounting

1. Mount the connecting plate (6) from the accessories in Table 4 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 **A_1** 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 **A_1** and **Z**.

Caution!
The sealing plug (1.5) in the Type 3730 Positioner should not be unscrewed out of the reversing amplifier.
The rubber seal (1.4) is not required and can be removed when the sealing plug is used.

Signal pressure connections

A_1: Output **A_1** leading to the signal pressure connection at the actuator which opens the valve when the pressure increases

A_2: Output **A_2** 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**.

6. Set to ***OFF*** after initialization in Code 16 (pressure limit)

2.5.1 Pressure gauge attachment

The mounting sequence shown in Fig. 10 remains unchanged. Screw a pressure gauge bracket onto the connections **A_1** and **Z**.

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

Pressure gauges for supply air Z and output A_1 as listed in Tables 1 to 4.

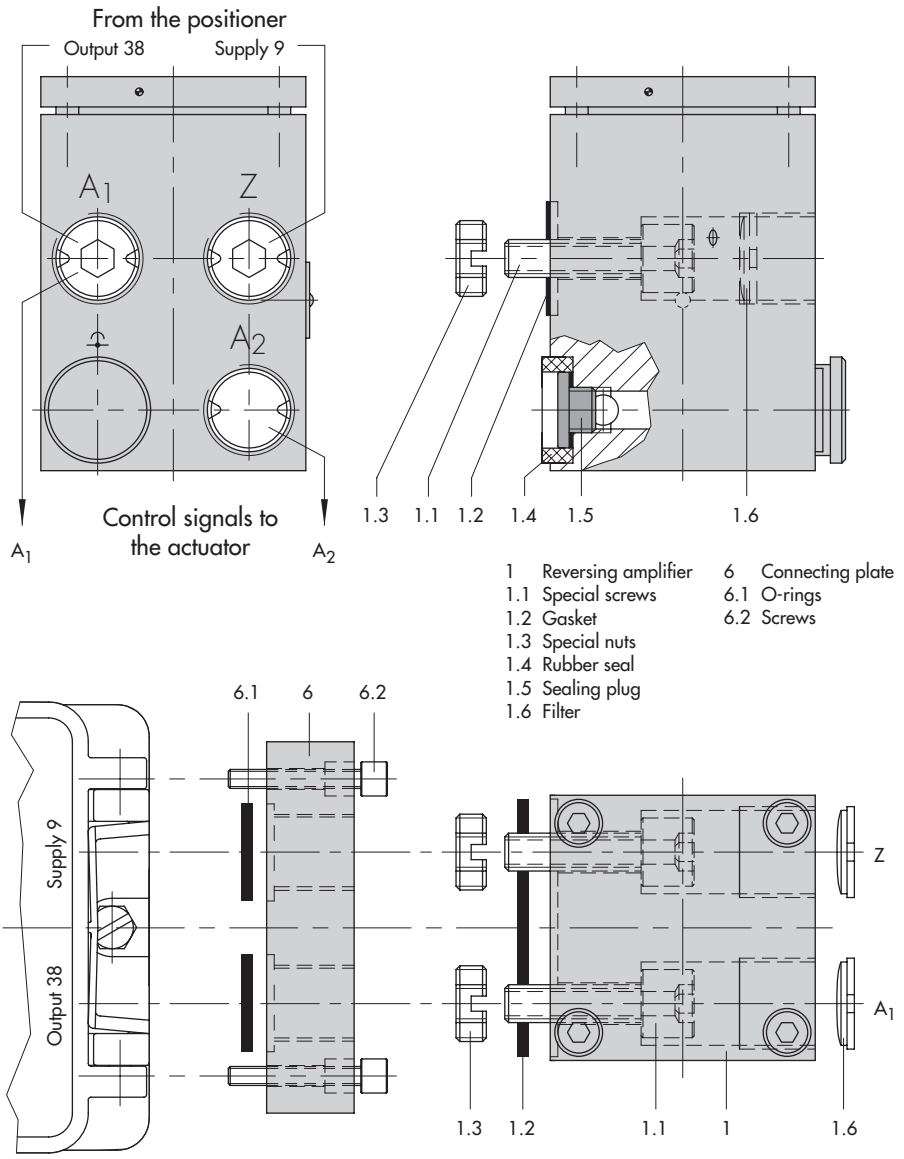


Fig. 10 · Mounting a reversing amplifier

2.6 Attaching an external position sensor

Refer to Table 6 on page 35 for a list of the mounting parts as well as the accessories required for mounting the position sensor. Accessories for the pneumatic connection to the positioner housing can be found in Table 7.

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.

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 m connecting lead with M12x1 connectors is included in the scope of delivery.

Note: *In addition, the instructions in section 3.1 and 3.2 apply for the pneumatic and electrical connection.*
Operation and setting are described in sections 4 and 5.

Fig. 11 · Positioner unit with sensor mounted on a micro-flow valve

2.6.1 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. 12 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. 12, 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 240 to 700 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

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 mounting plate (21).
3. Depending on the actuator size and rated travel of the valve, determine the required lever and position of the follower pin (2) from the travel table on page 15.
   The positioner is delivered with lever **M** in pin position **35** on the sensor. If necessary, remove the follower pin (2) from its pin position and move it to the borehole for the recommended pin position and screw tight.
4. Place the lever (1) and disk spring (1.2) on the sensor shaft.

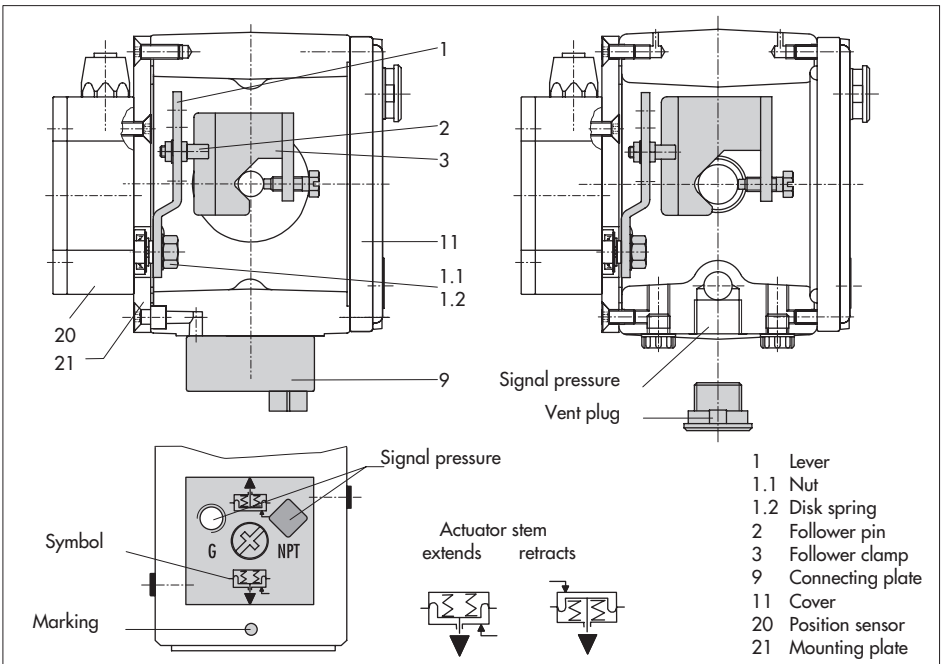


Fig. 12 · Mounting for Type 3277-5 Actuator (left) and Type 3277 Actuator (right)

Place the lever (1) **in mid-position** and **hold it in place**. Screw on the nut (1.1).

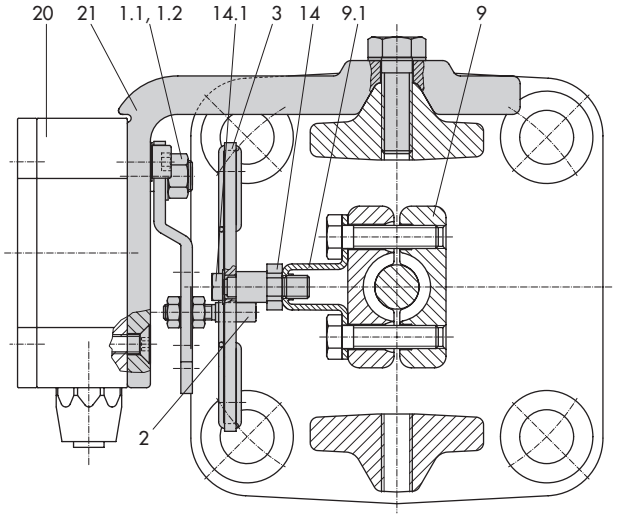
5. Place the follower clamp (3) on the actuator stem, align and fasten it, making sure that the fastening screw rests in the groove of the actuator stem.
6. Place the mounting plate (21) together with the sensor onto the actuator yoke so that the follower pin (2) rests on the top of the follower clamp (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.

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

For the required mounting parts as well as the accessories, refer to the order numbers listed in Tables 6 and 7 on page 35.

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.



1 Lever
1.1 Nut
1.2 Disk spring
2 Follower pin
3 Follower plate
9 Stem connector
9.1 Bracket
14 Bolt
14.1 Screws
20 Position sensor
21 Bracket

Fig. 13 · Mounting according to IEC 60534-6 (NAMUR)

For other actuator sizes or travels, select the lever and pin position from the travel table on page 15. 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).
4. 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).
5. 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.

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

For the required mounting parts as well as the accessories, refer to the order numbers listed in Tables 6 and 7 on page 35.

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 bracket (21).
3. 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).
4. Place the follower clamp (3) on the stem connector, align it at a right angle and screw tight.
5. 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).

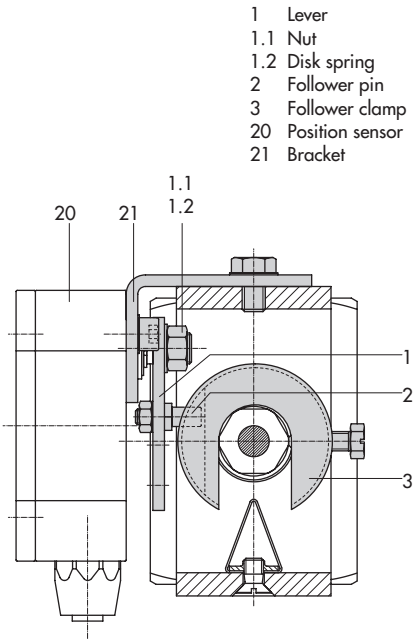


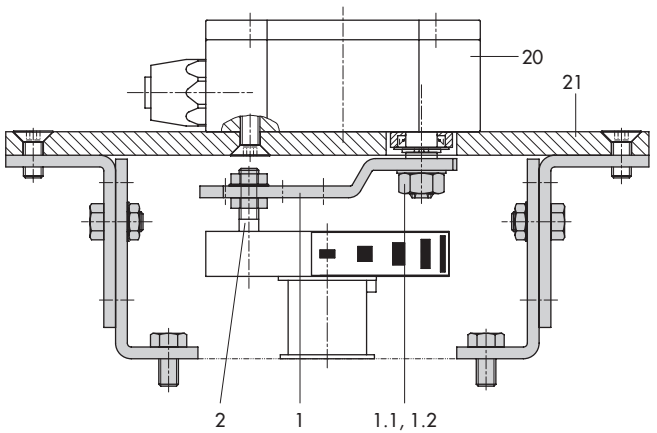
Fig. 14 · Mounting on a micro-flow valve

2.6.4 Mounting the position sensor to rotary actuators

For the required mounting parts as well as the accessories, refer to the order numbers listed in Tables 6 and 7 on page 35.

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 (∅ 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 2.4 Instead of the positioner, attach the position sensor (20) with its mounting plate (21).



1 Lever
1.1 Nut
1.2 Disk spring
2 Follower pin
20 Position sensor
21 Mounting plate

Fig. 15 · Positioner unit with sensor mounted on rotary actuators

Table 6	Mounting parts for position sensor		Order no.
Direct attachment	Mounting parts for actuators with 120 cm² see Fig. 12 left		1400-7472
Accessories for actuator 120 cm²	Connecting plate (9, old) for Actuator Type 3277-5xxxxxx.**00**	G 1/8 1/8 NPT	1400-6820 1400-6821
	Connecting plate (new) for Actuator Type 3277-5xxxxxx.**01** (new)		1400-6823
	***Note**: Only new switchover and connecting plates can be used with new actuators (Index 01). Old and new plates are not interchangeable.*		
Direct attachment	Mounting parts for actuators with 240, 350 and 700 cm², see Fig. 12 right		1400-7471
NAMUR attachment	Mounting parts for attachment to NAMUR rib w. lever L and XL, see Fig. 13		1400-7468
Attachment to micro-flow valves	Mounting parts for Type 3510 Micro-flow Valve, see Fig. 14		1400-7469
Attachment to rotary actuators	VDI/VDE 3845 for all sizes of fixing level 2 Mounting parts with follower clamp and coupling wheel CrNiMo steel bracket, see Fig. 15		1400-7473
	VDI/VDE 3845 for all sizes of fixing level 2, heavy-duty version		1400-9384
	SAMSON Type 3278 160 cm² / VETEC Type S160 and Type R, heavy-duty version		1400-9385

Table 7	Positioner accessories		Order no.
Accessories	Connecting plate (6)	G ¼ ¼ NPT	1400-7461 1400-7462
	or pressure gauge bracket (7)	G ¼ ¼ NPT	1400-7458 1400-7459
	Pressure gauge mounting kit (8) up to max. 6 bar (output and supply)	St. steel/Brass St.st./St. steel	1400-6950 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

2.7 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 made of stainless steel is available (order number listed below). Pressure gauge brackets and pneumatic reversing amplifiers in stainless steel are* ***not*** *available.*

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

The Tables 1 to 5 (pages 16 and 17) 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.

2.8 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 21) at the connection block and make a pneumatic connection to the spring chamber on the vented side.

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

Caution!
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.

3 Connections

3.1 Pneumatic connections

Caution!
The threads in the positioner housing are not designed for direct air connection!

The screw glands 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 ¼ NPT or G ¼ thread.
The customary fittings for metal and copper pipes or plastic hoses can be used.

Important!
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 tubes 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.

3.1.1 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).

3.1.2 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 ATO)

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 ATC)

Fail-safe position "Valve Open"
(for globe and angle valves):
For tight-closing valves, the maximum signal pressure pst_{max} is roughly estimated as follows:

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

d = Seat diameter [cm]
Δp = Differential pressure across the valve [bar]
A = Actuator diaphragm area [cm²]
F = Upper bench range of the actuator [bar]

If there are no specifications, calculate as follows:

Required supply pressure =
Upper bench range value + 1 bar

Note!
The signal pressure at the output (Output 38) of the positioner can be limited to 1.4, 2.4 or 3.7 bar over Code 16 or the pressure limit can be deactivated (MAX).

3.2 Electrical connections

For electrical installation, you are required to observe the relevant electrotechnical regulations and the accident prevention regulations that apply in the country of use. In Germany, these are the VDE regulations and the accident prevention regulations of the employers' liability insurance association.

The following standards apply for assembly and installation in hazardous areas: EN 60079-14: 2003 (VDE 0165 Part 1/ 8.98) "Electrical apparatus for explosive gas atmospheres" and EN 50281-1-2: 1999 (VDE 0165 Part 2/11.99) "Electrical apparatus for use in the presence of combustible dust".
For the interconnection of intrinsically safe electrical equipment, the permissible maximum values specified in the EC type examination certificate apply (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).

The following applies for equipment with type of protection EEx nA (non-sparking apparatus) according to the standard EN 50021 (1999): Connecting, interrupting, or switching circuits while energized is only allowed during installation, maintenance or repair work.

The following applies for equipment connected to energy-limited circuits with type of protection EEx nL (energy-limited apparatus) according to the standard EN 50021 (1999): This type of equipment may be switched under normal operating conditions.

For the interconnection of equipment to energy-limited circuits with type of protection EEx nL IIC, the permissible maximum values specified in the statement of conformity or the addenda to the statement of conformity apply.

Caution!
The terminal assignment specified in the certificate must be adhered to. Reversing the assignment of the electrical terminals may cause the explosion protection to become ineffective!
Do not tamper with the enameled screws inside or on the housing.

Note on the selection of cables and wires:
To install intrinsically safe circuits, observe section 12 of the standard EN 60079-14: 2003 (VDE 0165 Part 1). To run multi-core cables or lines with more than one intrinsically safe circuit, section 12.2.2.7 of this standard applies.
An additional cable gland can be installed when connecting the device over two separate cables. Cable entries left unused must be sealed with blanking plugs. Devices used at ambient temperatures down to –20 °C must have metal cable entries.

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.

Note: *The power supply for the positioner can be supplied either over the connection to the fieldbus segment or over a DC voltage source (9 to 32 V) connected to the bus terminals in the positioner.*
You are required to observe the relevant regulations for use in hazardous areas*.*

Bus line

The shielded PROFIBUS connecting cable is to be routed over the electromagnetic-compatible brass cable gland (standard) in the positioner to the terminals. The shield, which is placed over the clamping insert, is connected over a large area to the gland and housing.

1. To connect the bus line, loosen the gland nut and the clamping insert from the positioner and remove the dust cap.
2. Slide the gland nut and clamping insert over the connecting cable.
3. Strip the insulation off the end of the bus line to the required connecting length and cut the wire shield off up to a length of approx. 13 mm. If necessary, cut off any cable core filling as well.
4. Disentangle the braided shield and pull it over the clamping insert.

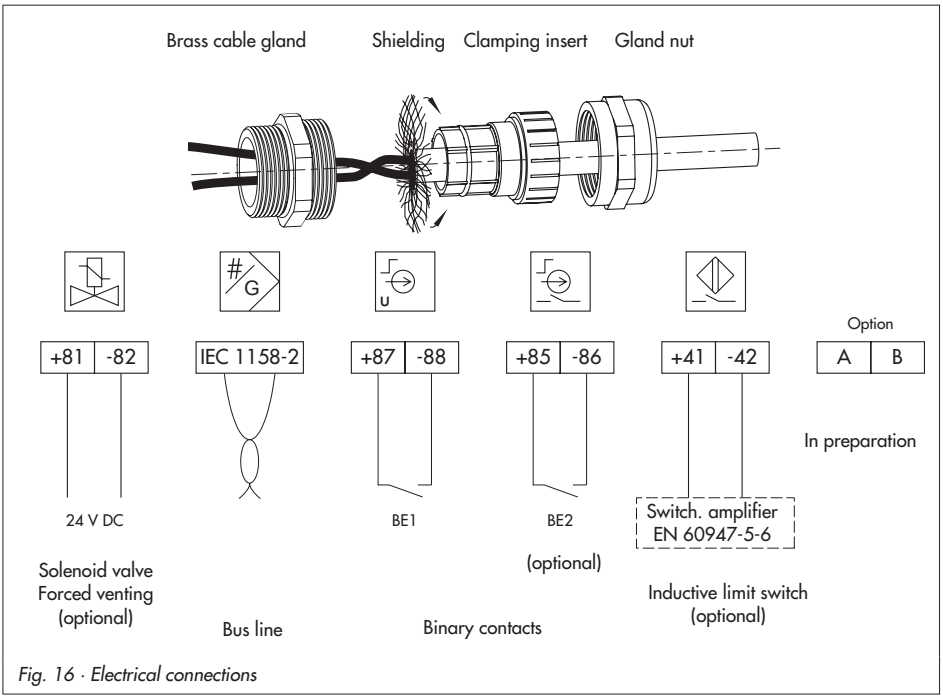


Fig. 16 · Electrical connections

5. Press the clamping insert into the connecting screw gland and screw tight the gland nut until the connecting cable is clamped tightly.
6. Route the two-wire bus line to the screw terminals marked "IEC 1158-2", whereby no polarity has to be observed.

Refer to the PROFIBUS-PA User + Installation Guide (PNO document 2.092) for more information.

Note: *To connect the limit switch, binary inputs and forced venting, an additional cable gland that needs to be fitted in place of the existing blanking plug is necessary.*
Open cable glands are not permissible as the degree of protection IP 66 only applies when the positioner housing is sealed.

Limit switch

For operation of the limit switches, switching amplifiers have to be connected in the output circuit. Their function is to control the limit values of the control circuit according to EN 60947-5-6, thus ensuring operational reliability of the positioner. If the positioner is installed in hazardous areas, the relevant regulations must be observed.

Binary input 1

An active contact can be operated at binary input 1. The positioner can report the switching state over the bus protocol.

Binary input 2

A passive, floating contact can be operated at binary input 2.

The positioner can report the switching state over the bus protocol.

Solenoid valve (forced venting function)

For positioners fitted with the optional solenoid valve for the forced venting function, a voltage of 24 V DC must be connected to the relevant terminals +81 and –82.

Caution!
If there is no voltage connected for the solenoid valve at terminals +81 and –82 or when the voltage signal is interrupted, the positioner vents the actuator and does not respond to the reference variable.
Observe the switching thresholds specified in the technical data.

3.2.1 Establishing communication

The communication structure between the controller, logic solvers (PLC) or automation system, or between a PC or work station and the positioner(s) is implemented by a segment coupler (see Fig. 17) conforming to PROFIBUS directives.
Explosion-protected versions of PROFIBUS-PA segment couplers must be used in hazardous areas.
A maximum of 32 positioners may be operated in parallel over a segment coupler in one PROFIBUS-PA segment. In hazardous areas, the number of positioners that can be connected is reduced.
Each positioner connected in the segment must be assigned a unique bus address between 0 and 125 (refer to section 5.11).

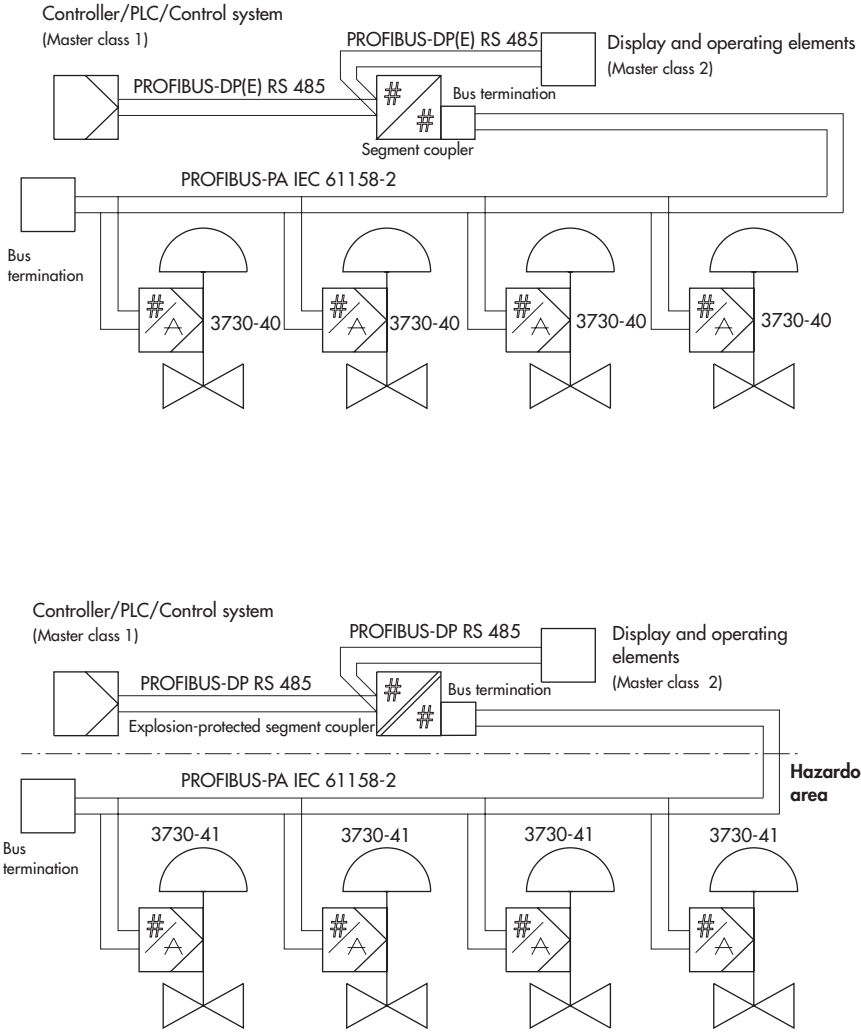


Fig. 17 · Connection according to PROFIBUS, for safe areas (top) and hazardous areas (bottom)

4 Operation

Note: *A summary about operating and start up can be found in section 8 on page 69.*

4.1 Operator controls and readings

Rotary pushbutton

The positioner is mainly operated with the rotary pushbutton.

Turn the ⊛ button to select and set codes, parameter and values. Press to confirm.

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 applied to the actuator.
For positioners with an attached reversing amplifier for double-acting rotary actuators (section 2.5): switch position AIR TO OPEN.

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.
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.

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), set restriction to MIN SIDE.
- For a connection at the back (Type 3277-5), set restriction to MIN BACK.
- For actuators 240 cm² and larger, set to MAX SIDE for a side connection and to MAX BACK for a connection at the back.

Readings on the display

A self test is performed automatically (***tEStinG*** runs across the display) when the positioner starts up for the first time after the electrical auxiliary power has been connected.
Icons appear on the LC display that are assigned to parameters, codes and functions. The bar elements in the operating modes manual ☞ and automatic ↻ 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 (see section 4.3.1), the lever position in degrees in relation to the longitudinal axis is indicated instead of the system deviation. One bar element corresponds to approximately a 5° angle of rotation.
If the fifth element blinks (value displayed > 30°), the permissible angle of rotation has been exceeded. Lever and pin position must be checked.

Readings on the display and their meaning

AUtO	Automatic mode	***RUN***	Start
CL	Clockwise	***SAFE***	Fail-safe position
CCL	Counterclockwise	***SUb***	Substitute calibration
Err	Error	***TunE***	Initialization in progress
ESC	Escape	***YES***	Available
LOW	w too small	***ZP***	Zero calibration
MAN	Manual mode	***tEStinG***	Test function active
MAX	Maximum range		
NO	Not available	↗↗	Increasing/increasing
NOM	Nominal travel	↗↘	Increasing/decreasing
ON	On		
OFF	Off		
RES	Reset		

blinking Emergency mode (error code 62 x signal, see p. 123)

blinking Not initialized

S blinking No valid setpoint exists or valve has been moved to fail-safe position by SET_FAIL_ SAFE_POS (see p. 81)

and together
AO Transducer Block is in MAN mode

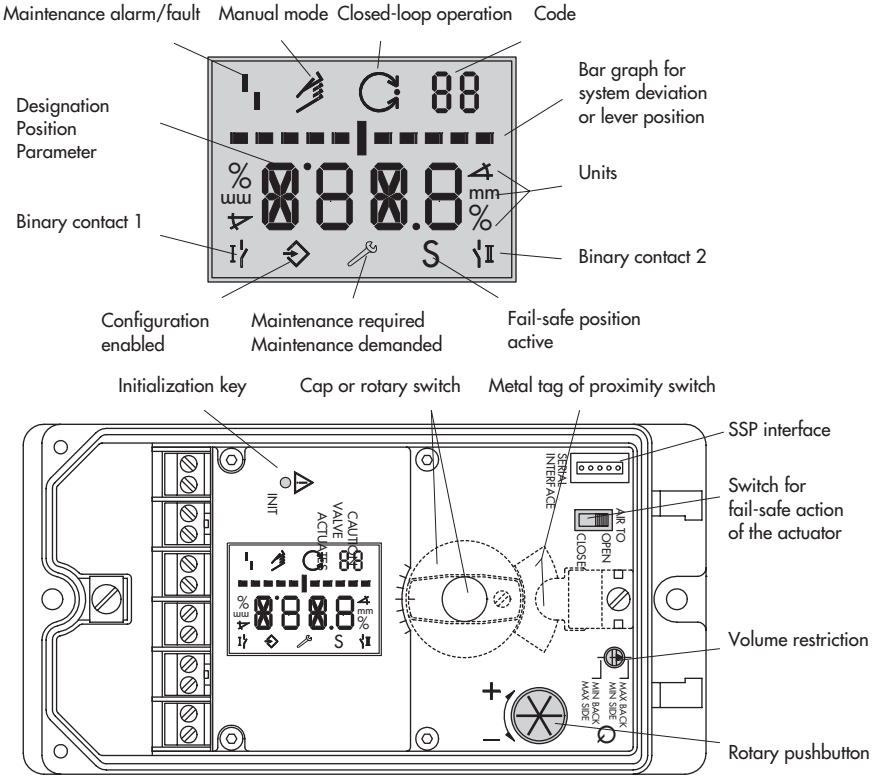
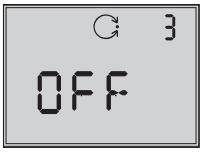


Fig. 18 · Display and operator controls

4.2 Enabling and selecting parameters

The codes which are marked with an asterisk (*) in section 14.1 on page 110 onwards must be enabled with Code 3 before the associated parameters can be configured as described below.



Code ***3***
Configuration not enabled

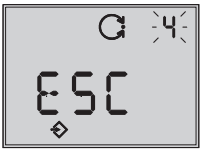
Configuration enabled

- From the current display, turn the rotary pushbutton until Code **3** and OFF appear on the display.
  Confirm Code **3** by pressing the ⊛ button, the code number blinks.

- Turn ⊛ button until ***ON*** appears.
  Confirm setting by pressing the ⊛ button.

Configuration is enabled and is indicated by ⇨ symbol appearing on the display.
Now you can adjust the codes, parameters and values for the control valve in any desired order by turning the ⊛ button. Confirm settings by pressing the ⊛ button.

Important!
*To cancel a value that you have just entered under a code, turn the ⊛ button until **ESC** appears on the display and press to confirm.*



Canceling the setting

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

The code list in section 14.1 on page 110 onwards shows all parameters that can be adjusted, including their description and their default settings.

Important!
After attaching the positioner to the valve as well as setting the fail-safe position and the volume restriction, it is sufficient for standard operation to press the initialization key in order to ensure optimum positioner operation (section 5.6 on page 52).
For this purpose, the positioner must be operated with its default values. If necessary, a reset must be carried out (section 5.9 on page 61).

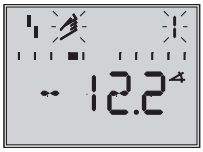
4.3 Operating modes

4.3.1 Automatic and manual operating modes

Prior to initialization:

If the positioner has not been initialized yet, the automatic operating ***AUtO*** cannot be selected.
The valve can only be positioned manually with the positioner.

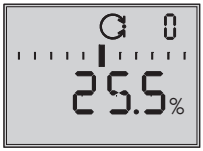
To proceed, turn ⊛ button clockwise until Code ***1*** appears, then confirm Code ***1*** by pressing the ⊛ button.



If both the code number and the hand symbol are blinking, the valve can be manually positioned by turning the ⊛ button.

After initialization:

After successful initialization in the ***MAX***, ***NOM*** or ***MAN*** mode (section 5.6.1), the positioner is in the automatic control operation mode ↻.

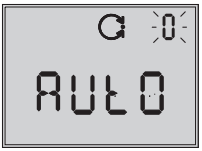


Default

Switching to manual operating mode

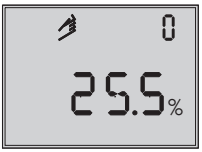
Over Code ***0***, press the ⊛ button, ***AUtO*** appears in the display, Code ***0*** blinks.

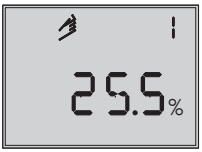
Turn ⊛ button until ***MAN*** appears.



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

Adjusting the manual set point





Turn ⊛ button until Code ***1*** appears.

Press ⊛ button to confirm, Code ***1*** blinks.

While Code ***1*** is blinking, you can move the valve to the position required by turning the button. To proceed, turn the button until enough the positioner has built up enough pressure and the control valve starts to react. The positioner automatically returns to manual mode with Code ***0*** if the button is not activated within two minutes.

Switching from manual to automatic operating mode works in the same manner. First, you must reset the positioner over Code ***0*** to automatic mode ***AUtO*** and confirm this setting.

4.3.2 SAFE – Fail-safe position

If you want to move the valve to fail-safe position, proceed as follows:

Select Code ***0***, press the ⊛ button, ***AUtO*** or ***MAN*** appears on the display, Code ***0*** blinks.

Turn the ⊛ button until ***SAFE*** appears.

Press the ⊛ button to confirm this setting.

Caution!
*The valve moves to the fail-safe position. The **S** symbol for the fail-safe position appears on the display.*

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

If you want to return the valve from the fail-safe position to the operating mode ***AUtO*** or ***MAN***, the ⊛ button must be pressed while Code ***0*** is active.

When the code number blinks, turn the ⊛ button to switch to the desired operating mode.
Press the ⊛ button to confirm.

Note: *The valve can be moved to the fail-safe position over the fieldbus by the SET_FAIL_SAFE_POS parameter (see page 174).*

5 Start-up and settings

Note: *A summary about start-up and operation can be found in section 8 on page 69.*

- Connect pneumatic supply air (Supply 9), making sure the pressure is correct as described in section 3.1.
- Apply the electric reference variable as described in section 3.2.
- The voltage supply >19 V DC for version with a solenoid valve must be connected at terminals 81 (+) und 82 (–).

Warning!
Supply pressure may cause the actuator stem to move.
Risk of injury!

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.
*A valid set point from the process control system still does not exist if a blinking **S** appears on the display (see page 81).*

5.1 Determining the fail-safe 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/valve closed

AIR TO CLOSE = Signal pressure closes the valve, for fail-safe position: actuator stem retracts/valve open.

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.
The positioner only needs to be initialized again after the fail-safe action of the actuator has been changed.

5.2 Setting the volume restriction Q

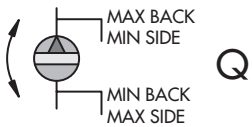


Fig. 19 · Volume restriction Q MAX BACK/MIN SIDE setting

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*

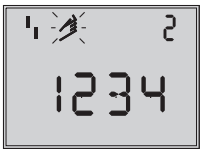
Signal pressure \ Transit time	< 1 s	≥ 1 s
Connection at the side	MIN SIDE	MAX SIDE
Connection at the back	MIN BACK	MAX BACK

* Intermediate positions are not permitted.

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

5.3 Adapting the display

The data representation on the positioner display can be turned by 180°.
If the displayed data appear upside down, proceed as follows:



Reading direction for right attachment of pneumatic connections

Reading direction for left attachment of pneumatic connections

Turn the ⊛ button until Code ***2*** appears, and press the ⊛ button to confirm Code ***2***, Code ***2*** blinks.

Turn ⊛ button until the display is adjusted to the desired direction, then confirm reading direction by pressing the ⊛ button.

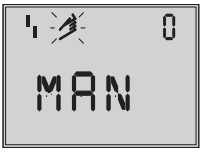
5.4 Limiting the signal pressure

If the maximum actuator force may cause damage to the valve, the signal pressure must be limited. Select Code ***3*** to enable configuration and then access Code ***16*** to set the pressure limit to 1.4, 2.4 or 3.7 bar.

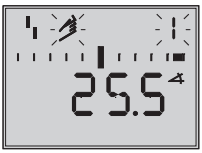
The required signal pressure limit is only automatically recognized on initialization when the fail-safe position AIR TO OPEN is set.

5.5 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.



Code 0
Select
manual operation
Default ***MAN***



Code 1
Position valve using the rotary pushbutton, the current angle of rotation is indicated

1. Turn the ⊛ button until Code ***0*** appears, then confirm Code ***0*** by pressing the ⊛ button.
2. Turn the ⊛ button until ***MAN*** appears in the display, i.e. manual operating mode, confirm selected operating mode by pressing the ⊛ button.
3. Turn the ⊛ button until Code ***1*** appears, confirm Code ***1*** by pressing ⊛ button. The hand symbol and Code ***1*** blink.
4. Position control valve by turning the ⊛ button several times until pressure 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°.
   The permissible range has been ex-

ceeded when the displayed angle is higher than 30°, and the outer right or left bar graph element blinks.
If this is the case, it is absolutely necessary to check lever and pin position as described in section 2.

Note: *If the selected pin position is smaller than intended for the respective travel range and exceeds 30°, the positioner switches to the* ***SAFE*** *mode, the valve moves to the fail-safe position (see section 4.3.2 on page 48).*

---

5. Initialize positioner as described in section 5.6.

Simplified start-up!
For most applications, the positioner with its default settings is ready for operation, provided it has been properly attached.
After the fail-safe position and the volume restriction have been set, the positioner only needs to be initialized by pressing the INIT key.

Caution!
Prior to starting the initialization procedure, check the maximum permissible supply pressure of the control valve to prevent the valve from being damaged. On initialization, the positioner supplies the maximum available supply pressure. If necessary, restrict the signal pressure by using a pressure reducing valve upstream of the control valve.
*Initialization is run in default mode **MAX** (section 5.6.1). During this process, the positioner adapts itself optimally to the maximum travel/angle of rotation range.*
*The only parameter that must be checked is the direction of action, i.e. whether the default setting (Code **7** to ↗↗ = increasing/increasing) matches the application or whether it must be changed.*
The initialization modes described in following serve to individually adapt and optimize the positioner to the way it is attached to the valve.

5.6 Initialization

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 (see section 5.6.1).
MAX is the default setting for initialization based on the maximum nominal range.

If configuration is enabled via Code ***3***, Code ***6*** can be used to change to other initialization modes.

If the positioner has been initialized once already, it will automatically go to the operating mode used last after the electrical reference variable is applied, Code ***0*** appears on the display.

If the positioner has not yet been initialized, the symbol appears on the display and the symbol starts to blink.

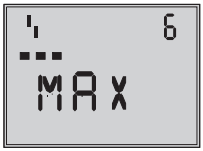
Important!
After the positioner has been mounted onto another actuator or its mounting location has been changed or prior to re-initializing the positioner, the positioner needs to be reset to its default settings. Refer to section 5.9 on page 61.

▶ **Start the initialization process by pressing the INIT key with a suitable tool.**

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

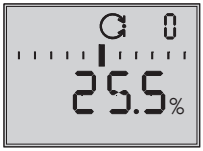
Positioners with EXPERT+ diagnostic functions start plotting the reference graphs after the initialization process has been completed. See note at the end of this section.

Warning!
During the initialization, the control valve moves through its entire travel/angle of rotation range. Therefore, do not start initialization while a process is running, but only during start-up, when all shut-off valves are closed.
Note: *The initialization procedure can be interrupted while running by pressing* ⊛ *.* ***StOP*** *appears three seconds long and the positioner then moves to the fail-safe position.*
The fail-safe position can be canceled again over Code ***0****.*



Alternating displays
Initialization running
Symbol depending on initialization mode selected

Bar graph display indicating the progress of the initialization



Initialization successful, positioner in automatic operating mode

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

The control position in % predetermined by the reference variable appears on the display.

A malfunctioning leads to the process being interrupted. The initialization error appears on the display according to how it has been classified by the condensed status. See section 5.7 on page 60.

If the slide switch is set to AIR TO CLOSE, the positioner automatically switches to the direction of action increasing/decreasing (↗↘) on successful completion of initialization. This results in the following assignment between reference variable and valve position:

Fail-safe position	Direction of action	Valve Closed at	Open at
Actuator stem extends FA AIR TO OPEN	↗↗	0 %	100 %
Actuator stem retracts FE AIR TO CLOSE	↗↘	100 %	0 %

The tight-closing function is activated.
Set Code ***15*** (final position w>) to 99 % for three-way valves.
Further settings relevant for the valve can be entered subsequently.

Note on EXPERT+: *Positioner with integrated EXPERT+ diagnostics automatically start to plot the reference graphs (drive signal y d1 and hysteresis d2) after initialization has been completed. TEST d1 and d2 appear on the display in an alternating sequence.*

An unsuccessful plotting of the reference graphs is indicated on the display by Code 81 (see error code list).
After the initialization has been successfully completed, the positioner still works properly, even though the reference graph plotting has not been completed successfully.
The plotting of the reference graphs can be interrupted by pressing ⊛.
The reference graphs are required for the extended diagnostic functions of EXPERT+.

5.6.1 Initialization modes

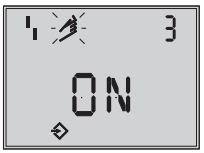
After enabling configuration with Code ***3*** and accessing Code ***6***, you can choose one of the initialization modes ***MAX***, ***NOM***, ***MAN*** or ***SUb*** to start initialization.
ZP, the zero calibration is described in section 5.8 on page 61.

MAX – Initialization based on maximum range

Initialization mode for simplified start-up for valves with two clearly defined mechanical travel stops, e.g. three-way valves.

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 %.

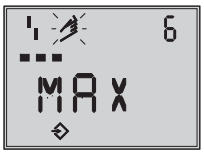
Enable configuration:



Default ***OFF***

Turn ⊛ → Code ***3***, press ⊛,
turn ⊛ → ***ON***, press ⊛.

After enabling:



Default ***MAX***

Turn ⊛ → Code ***6***, press ⊛,
turn ⊛ → ***MAX***, press ⊛.

▶ **Press INIT key to start initialization!**

⚠ *The initialization procedure may take several minutes, depending on the actuator size, as the valve moves through its entire travel/angle of rotation range.*

Positioners with EXPERT+ diagnostic functions automatically start plotting the reference graphs after the initialization process has been completed. See page 53.

Note: *For this **MAX** initialization, the positioner cannot indicate the nominal travel/angle of rotation in mm/° at first, Code **5** remains disabled. In addition, the lower (Code **8**) and the upper (Code **9**) x-range value can only be displayed in % and modified .*

If you want the display to indicate mm/°, proceed as follows after configuration has been enabled:

Turn ⊛ → Code ***4***, press ⊛,

turn ⊛ → Select pin position determined on attachment, press ⊛.

If you now switch to Code ***5***, the nominal range appears in mm/°.
The lower and upper x-range values for Code ***8*** and ***9*** are displayed in mm/° and can be adapted accordingly.

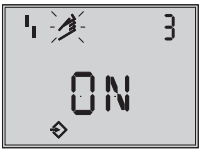
NOM – Initialization based on nominal range

Initialization mode for globe valves, especially for valves with maximum ranges that are clearly greater than the required nominal range.
For this initialization mode, the following parameters must be entered: pin position (Code ***4***) and nominal travel/angle (Code ***5***).

The calibrated sensor enables the effective valve travel to be preset very accurately. During the initialization procedure, the positioner checks whether the control valve can move through the indicated nominal range (travel or angle) without collision. In case of a positive result, the indicated nominal range is adopted with the limits of lower x-range and upper x-range values as the operating range.

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

Enable configuration:

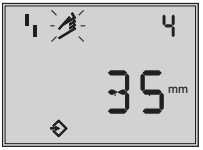


Default ***OFF***

Turn ⊛ → Code ***3***, press ⊛,

turn ⊛ → ***ON***, press ⊛.

After enabling:



Default ***OFF***

Turn ⊛ → Code ***4***, press ⊛,

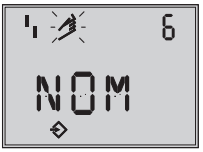
press ⊛ → Select pin position determined on attachment,
press ⊛.

Default ***15***

Turn ⊛ → Code ***5***, press ⊛,

turn ⊛ → Enter nominal travel/angle,

press ⊛.



Default ***MAX***

Turn ⊛ → Code ***6***, press ⊛,

turn ⊛ → ***NOM***, press ⊛.

Press INIT key to start initialization!

The initialization procedure may take several minutes, depending on the actuator size, as the valve moves through its entire travel/angle of rotation range.

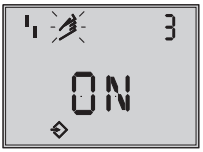
Positioners with EXPERT+ diagnostic functions automatically start plotting the reference graphs after the initialization process has been completed. See page 53.

Check the direction of action and, if necessary, set over Code ***7***.

MAN – Initialization based on a manually selected range

(with default upper x-range value by means of manual adjustment).
Initialization mode just as ***NOM***, however, for starting up valves with unknown nominal range.
In this mode, the positioner expects the control valve to be moved manually to the desired OPEN position prior to enabling the initialization procedure.
The upper range travel/angle of rotation value is adjusted using the rotary pushbutton. The positioner uses this OPEN position and the CLOSED position to calculate the differential travel/angle and accepts it as the operating range with the lower x-range value and upper x-range value being the limits.

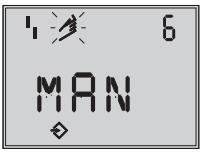
Enable configuration:



Default ***OFF***

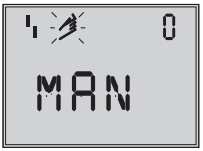
Turn ⊛ → Code ***3***, press ⊛,
turn ⊛ → ***ON***, press ⊛.

After enabling:
Turn ⊛ → Code ***4***, press ⊛,
turn ⊛ → Select pin position determined on attachment, press ⊛.
Turn ⊛ → Code ***6***, press ⊛,
turn ⊛ → ***MAN***, press ⊛.



Default ***MAX***

Turn ⊛ → Code ***0***, press ⊛,
turn ⊛ → ***MAN***, press ⊛.



Default ***MAN***

Turn ⊛ → Code ***1***, press ⊛,
Code 1 blinks.

Turn ⊛ until the valve reaches its OPEN position, press ⊛.

▶ **Press INIT key to start initialization!**

⚠ *The initialization procedure may take several minutes, depending on the actuator size, as the valve moves through its entire travel/angle of rotation range.*

Positioners with EXPERT+ diagnostic functions automatically start plotting the reference graphs after the initialization process has been completed. See page 53.

SUb
(substitute configuration, without initialization)

A complete initialization procedure takes several minutes and requires the valve to move through its entire travel range several times. In the event a positioner must be replaced while the plant is running, this mode allows the replacement to be performed with the minimum amount of disruption to the plant.

This initialization mode is an emergency mode. The positioner parameters are estimated and not determined by an initialization procedure, so that a high stationary accuracy cannot be expected.
You should always select a different initialization mode if the plant allows it.

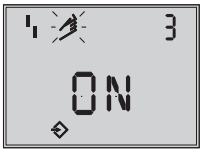
The initialization mode ***SUb*** is used to replace a positioner while the process is in operation. For this purpose, the control valve is usually fixed mechanically in a certain position, or pneumatically by means of a pressure signal which is routed to the actuator externally. The blocking position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

The spare positioner should not be initialized. If necessary, reset the spare positioner using Code ***36***.

After the old positioner has been replaced with a new one, the following parameters must be entered: pin position (Code ***4***), nominal range (Code ***5***), direction of action (Code ***7***) and closing direction (Code ***34***). The default travel limit of 100 % (Code ***11***) must be disabled with ***OFF***.
In addition, the blocking position (Code ***35***) must be adjusted with the ⊛ button so that it matches the position of the previously blocked valve.

The parameters K_P (Code ***17***), T_V (Code ***18***) and the pressure limit (Code ***16***) should remain set to their default values. If the configuration data of the new positioner are known, it is recommended to accept its K_P and T_V values.
After setting the AIR TO OPEN/CLOSE switch for the fail-safe position, setting the volume restriction and pressing the INIT key, the positioner calculates its configuration data on the basis of the blocking position and the closing direction as well as the other entered data.
The positioner switches to manual operation, subsequently the blocking position should be canceled as described on page 59.

Enable configuration:

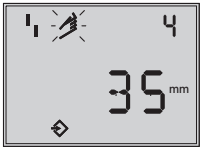


Default ***OFF***

Turn ⊛ → Code ***3***, press ⊛,

turn ⊛ → ***ON***, press ⊛.

After enabling:



Default ***OFF***

Turn ⊛ → Code ***4***, press ⊛,

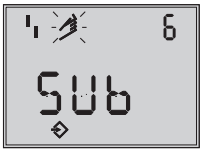
press ⊛ → Select pin position determined on attachment,
press ⊛.

Default ***15***

Turn ⊛ → Code ***5***, press ⊛,

turn ⊛ → Enter nominal travel/angle,

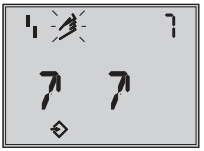
press ⊛.



Default ***MAX***

Turn ⊛ → Code ***6***, press ⊛,

turn ⊛ → ***SUb***, press ⊛.

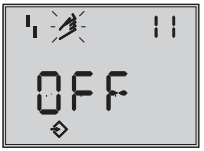


Default ↗↗

Turn ⊛ → Code ***7***, press ⊛,

turn ⊛ → Retain direction of action ↗↗ or select ↗↘.

Press ⊛.

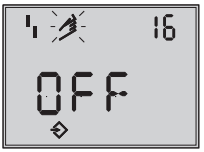


Default ***100.0***

Turn ⊛ → Code ***11***, press ⊛,

turn ⊛ → Deactivate travel limit,

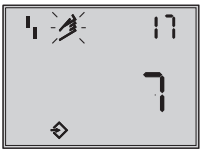
press ⊛.



Default ***OFF***

Turn ⊛ → Code ***16***,

Retain default value for pressure limit, change value only if necessary.



Default ***7***

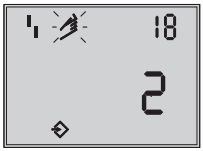
Turn ⊛ → Code ***17***

Retain default. Proceed as follows only if known:

Press ⊛,

turn ⊛ → Select KP,

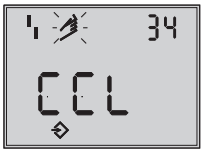
press ⊛.



Default ***2***

Turn ⊛ → Code ***18***,

Retain default TV, change only if known.



Default ***CCL***

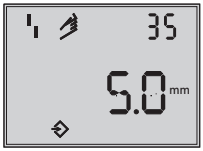
Turn ⊛ → Code ***34***, press ⊛,

turn ⊛ → Select closing direction.

CCL = counterclockwise and ***CL*** = clockwise.

Direction of rotation which causes the valve to move to the CLOSED position (view onto the rotary switch movement while positioner cover is open).

Press ⊛.



Default ***0.0***

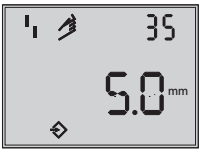
Turn ⊛ → Code ***35***, press ⊛,

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

Press ⊛.

- Set switch for **fail-safe position** AIR TO OPEN or AIR TO CLOSE as described in section 5.1 on page 49.
- Set volume restriction as described in section 5.2 on page 49.
- **Press INIT key!**

The positioner switches to manual operating mode!



The adjusted blocking position is indicated

As initialization has not been carried out completely, the error code ***76*** (no emergency mode) and possibly also error code ***57*** may appear on the display.
These alarms do not influence the positioner's readiness for operation.

Canceling the blocking position

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

Press ⊛ → Code ***1***, press ⊛,

turn ⊛ in order to move the valve slightly past the blocking position, then cancel mechanical blocking.

Press ⊛.

Turn ⊛ → Code ***0***, press ⊛,
Code ***0*** blinks.

Turn ⊛ until ***AUtO*** appears on the display.

Press ⊛ to confirm the operating mode.

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 corrected. 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 5.8 on page 61.

Caution!
The positioner automatically moves to zero point.

5.7 Fault/failure

All status and fault alarms are assigned a classified status in the positioner.

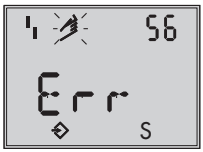
To provide a better overview, the classified alarms are summarized in a condensed status for the positioner (see section 6).

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

Condensed status	Display
Maintenance alarm	
Maintenance required/ Maintenance demanded	
Function check	Text
No message	

If the positioner has not been initialized, the diagnostic alarm "Device not initialized" is generated. The symbol appears on the display as the positioner cannot follows its reference variable.

To access the error codes, turn the button past the Code ***50***.
Err appears on the display with the respective error code.
For the cause of the fault and the recommended action, refer to the codes listed in section 14.1 on page 110 onwards.



Display indicating an error code

After an error code has occurred, you should first try to confirm it as follows:

Enable configuration:

Turn → Code ***3*** , press ,

turn → ***ON***, press .

Turn until the error code number appears, then press to confirm it.

Should the error occur again, read the remedy instructions in the error code list.

Occurrences such as when the total valve travel is exceeded or when the temperature

leaves the permissible temperature range affect the condensed state and cause a fault alarm to be displayed depending on its classification.

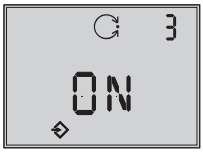
The optional EXPERT+ diagnostics generates additional diagnostic alarms which are included in the condensed status with their corresponding status classification.
When a diagnostic alarm is issued by EXPERT+, this is displayed by Code 79 (see error code list).

5.8 Zero calibration

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

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

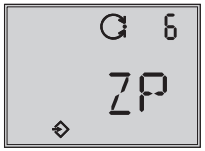
Enable configuration:



Default ***OFF***

Turn ⊛ → Code **3**, press ⊛,
turn ⊛ → ***ON***, press ⊛.

After enabling:



Default ***MAX***

Turn ⊛ → Code ***6***, press ⊛,
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.

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

5.9 Reset to default values

This function resets all parameters to the factory default values (see code list in section 14.1).

Enable configuration:

Default ***OFF***

Turn ⊛ → Code ***3***, press ⊛,
turn ⊛ → ***ON***, press ⊛.

After enabling:

Default ***OFF***

Turn ⊛ → Code ***36***, press ⊛,
turn ⊛ → ***RUN***, press ⊛.

All control parameters are reset and can be reconfigured.

Note: *Reset the control and identification parameters as well as the bus address with the FACTORY_RESET parameter (see page 134).*

5.10 Start-up via local interface (SSP)

The positioner can either be commissioned, configured, and operated on site, using the Fieldbus configuration or operating system, or TROVIS-VIEW operator interface connected over the serial interface in the positioner.

Use the TROVIS-VIEW software with 3730-4 device module installed.

To connect the positioner directly to the PC via the local serial interface, an adapter (order no. 1400-7700) is required.

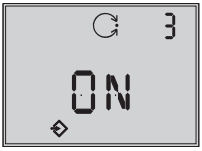
The positioner can be supplied with power by connecting it to a fieldbus segment or over a DC voltage source (9 to 32 V) connected to the bus terminals in the positioner. The simultaneous operation of TROVIS-VIEW and the fieldbus system is possible without any restrictions when connected to a PROFIBUS-PA segment.

5.11 Setting the bus address

A maximum of 32 positioners in a safe (non-hazardous) area can be operated over a segment coupler in one PROFIBUS-PA segment.

Each positioner connected in the segment must be assigned a unique bus address between 0 and 125.

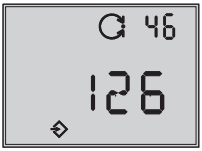
Enable configuration:



Default ***OFF***

Turn ⊛ → Code ***3***, press ⊛,
turn ⊛ → ***ON***, press ⊛.

After enabling:



Default ***126***

Turn ⊛ → Code ***46***, press ⊛,
turn ⊛ → required address,
press ⊛ 10 seconds → The address is adopted straightaway, provided that cyclic data exchange is **not** taking place.
During the cyclic data exchange, the newly set address for the positioner is saved and adopted after the cyclic data exchange is finished.
The newly assigned address is indicated un-

der Code 46 in alternating sequence with the current address. The new address is marked with "n" (new) and the currently used address with "o" (old).

Note: *The bus address can only be implemented by the PROFIBUS command SET_ADRESS when the bus address is set to the default setting [126].*

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6 Status and diagnostic alarms

The Type 3730-4 Positioner contains integrated diagnostics to generate classified status and diagnostic alarms.
There are two different types of on-board diagnostics available: the standard integrated diagnostics (EXPERT) and the optional extended EXPERT+ diagnostics.
The generated alarms can be classified and summarized according to the PROFIBUS Profile 3.01 and the extension "Condensed status and diagnostic messages" (refer to section 12.5 on page 92).

6.1 Standard EXPERT diagnostics

The standard EXPERT diagnostics provides information about positioner states such as operating hours counter, process monitoring, number of zero calibrations and initializations, total valve travel, temperature, initialization diagnostics, zero/control loop errors, logging of the last 30 alarms, etc. In addition, the standard EXPERT diagnostics generates diagnostic and status alarms which allow faults to be pinpointed quickly when a fault occurs.
In addition to the alarms being displayed on the positioner display, the classified alarms are also available over PROFIBUS-DP. Status alarms are classified as follows:

- Status
- Operation
- Hardware
- Initialization
- Data memory
- Temperature

6.2 Extended EXPERT+ diagnostics

In addition to the standard EXPERT diagnostic features, the optional EXPERT+ extended diagnostics provides the following in-service monitoring and out-of-service tests which enable significant statements on the condition of the entire control valve.

In-service monitoring (statistical information)

- Data logger
- Histograms
- Cycle counter
- Valve end position trend
- y = f (x) diagram (drive signal)
- Hysteresis test

Out-of-service tests (tests)

- y = f (x) diagram over the full range of the valve
- Hysteresis test over the full range of the valve
- Static characteristic
- Step response test

The diagnostic tests are completely integrated in the positioner. The PROFIBUS-DP allows parameters to be entered and test results to be read. The graph readings depend on the process control system used.

Further status alarms are generated from the extensive information gained in the diagnostic tests of EXPERT+ which provide the user with information covering the whole control valve.

The required reference graphs are automatically plotted after initialization and saved in the positioner if EXPERT+ is activated.

The optional diagnostic functions provided by EXPERT+ can be selected when ordering the positioner. Additionally, it is possible to activate EXPERT+ at a later point in time in an existing positioner. For this purpose, an activation code can be ordered, requiring the serial number of the positioner to be specified.

6.3 Classification of the status alarms and the condensed status

Note: *The following description only applies to positioners configured corresponding to the Profile 3.01 with the extension "Condensed status and diagnostic messages" (adjustable in COND_STATUS_ DIAG parameter of the Physical Block).*

The alarms are classified in the positioner, i.e. when an alarm is issued, it is assigned a status. The classification of the states can be changed.

To provide a better overview, the positioner state is summarized in a condensed state. This condensed state is made up from a summary of all classified status alarms.

If an event is classified as "No message", this event has no influence on the condensed status. If the classification "No message" is assigned for a diagnostic alarm, this alarm is not included in the diagnostic parameter. To be able to read all diagnostic alarms regardless of which classification they have been assigned to, these are entered in DIAGNOSIS_EXT_1_RAW and DIAGNOSIS_EXT_2_RAW parameters.

The following states can be selected (refer to Fig. 20):

- **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 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 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.
- **Process related fault/Out of specification**
  The current process conditions do not allow a valid calculation of values.
- **Function check**
  Test or calibration procedures are being performed. The positioner is temporarily unable to perform its control task until this procedure is completed.

The table below containing the condensed state is reached from the summary of active alarms.

Status modification

The classification of the status alamrs can be assigned as required using the TROVIS-VIEW software connected to the local SSP interface of the positioner or over the PA parameters.

Caution!
All extended alarms issued by the EXPERT+ diagnostics are assigned the "No message" status.

Logging and displaying diagnostic functions/alarms

The last 30 alarms are logged in the positioner. An alarm that is repeated is only logged when it first occurs.

The alarms and the condensed state appear on the display as described in the code list (section 14.1). In addition, the diagnostic parameters are available over the communication interface of the positioner.

The diagnostic functions can easily be displayed and configured using the TROVIS-VIEW software connected over the local interface (SSP) or over PROFIBUS.

Condensed state

Status alarm	Engineering tool/ **TROVIS-VIEW** (version 3.40 and higher)	Positioner display
No message, ok	 green	
Function check	 orange	***tEsting***, ***tunE*** or ***tEst***
Maintenance required Maintenance demanded	 blue	
Process related fault Out of specification		
Maintenance alarm	 red	

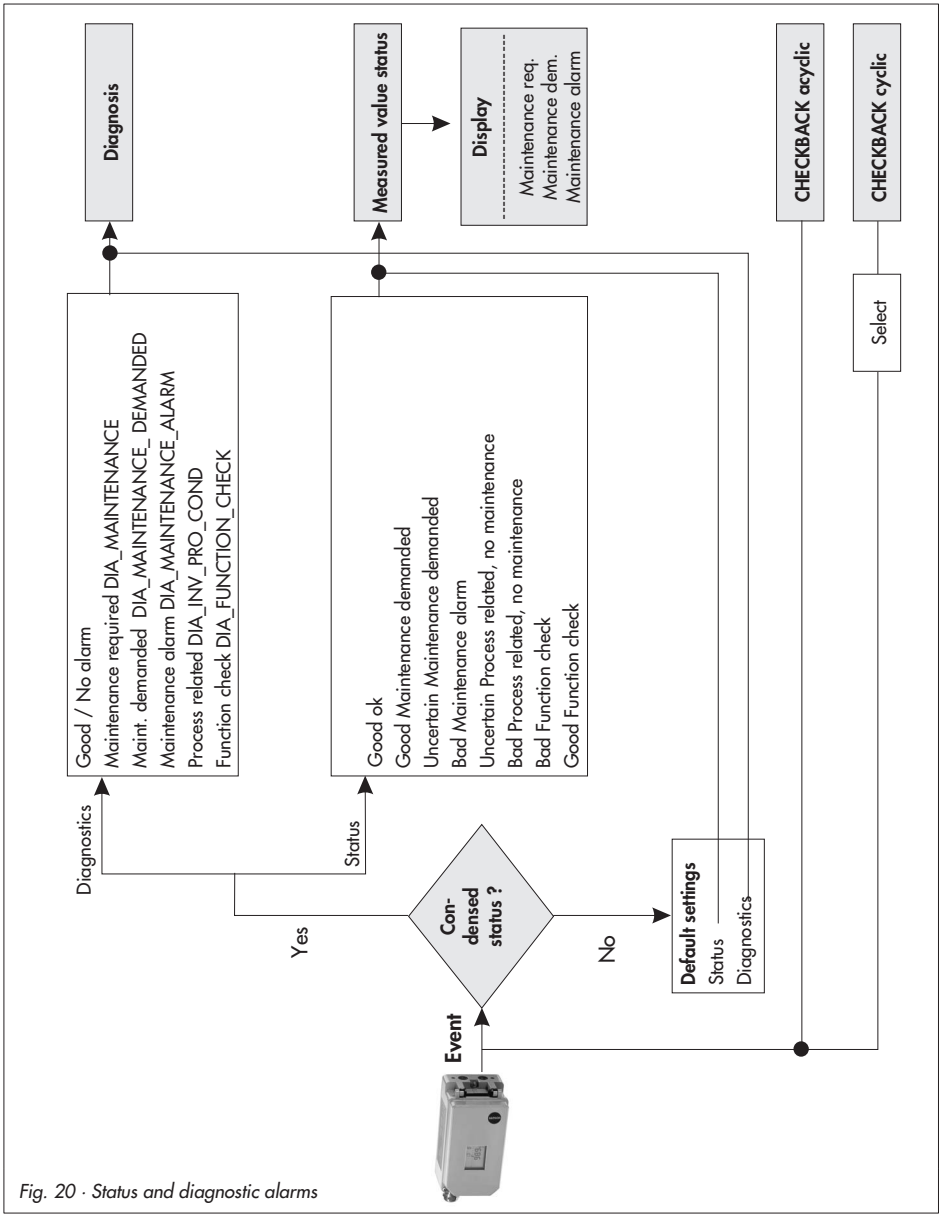

Fig. 20 · Status and diagnostic alarms

7 Adjusting the limit switch

The positioner version with an 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 3.2.1) 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.

Setting the switching point:

Note: *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).

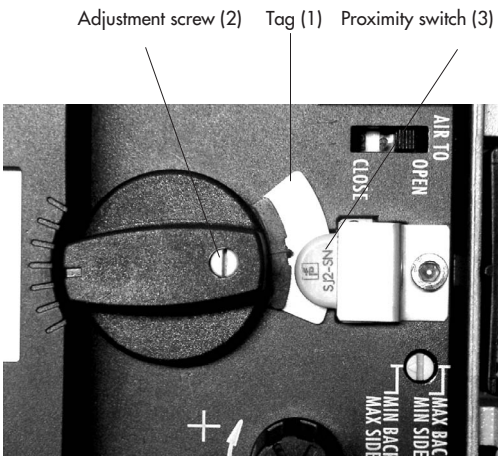

Fig. 21 · Adjustment of the limit switch

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.

8 Quick start-up guide

8.1 Mounting

Direct attachment to SAMSON Type 3277 Actuator

Travel mm	Actuator cm²	Pin position
7.5	120	25
15	120/240/350	35
15/30	700	50

Note: *Standard delivery includes lever M ready assembled with the follower pin on 35 mm pin position for 15 mm travel!*

To mount the positioner, lift the lever so that the follower pin rests on the follower clamp of the actuator stem.

NAMUR attachment

- Determine the maximum travel range of the control valve from the closed position to as far it will go in the other direction.
- Select the lever to match the maximum travel range as well the next largest pin position and screw onto the shaft of the positioner.
- Lever option/pin distance:
  see pin position table (Code 4) or cover plate on the positioner.
- Screw the NAMUR bracket onto the valve yoke so that it is aligned centrally to the slot of the follower plate when the travel position is at 50 %.
- Secure the positioner to the NAMUR bracket, making sure that the follower

pin is in the slot of the follower plate. Make sure the lever can still move.

Attachment to rotary actuators

- Lever M pin position 90°
- Put the valve into the closed position, determine the opening direction.
- Place the follower plate on the slotted actuator shaft and fasten it to the coupling wheel. Attach the top pair of brackets and the bottom pair of brackets to the actuator.
- Place the positioner on the brackets and screw tight, making sure that the lever with its follower pin engages the slot of the coupling wheel, while taking into account the opening direction.
  It is important to make sure that the lever's mid position corresponds to the mid travel of the valve (lever's mid position = the lever is parallel to the long side of the positioner housing).

Pneumatic connections

- Screw the threaded parts only into the attached connection block, connecting plate or pressure gauge block from the accessories.

8.2 Start-up

- Connect pneumatic supply air (1.4 to 6 bar).
- Route the two-wire bus line to the screw terminals marked "IEC 1158-2", a particular polarity does not need to be observed.
  Alternatively, the power supply for the positioner can be supplied over a DC voltage source (9 to 32 V) connected to the bus terminals in the positioner.
  You are required to observe the relevant regulations for use in hazardous areas.

Set the fail-safe position

Position the slide switch according to fail-safe position of the control valve: AIR TO OPEN or AIR TO CLOSE.

Adapt the volume restriction Q to the actuator size

Only set the restriction for actuators < 240 cm² to:
MIN SIDE for connection at the side or
MIN BACK for connection at the back.

Caution!
After each change of the volume restriction setting, the positioner must be re-initialized.

Changing the reading direction of the display

(if necessary)

Turn ⊛ → Code ***2***, press ⊛,

turn ⊛ → Display OK, press ⊛.

Operation

Selecting the parameters or values

Each parameter has a code number which is shown in the display.
Turn the ⊛ button to select parameters or values and then **push** to confirm.

Select and confirm ***ESC*** to prevent an entered value from being accepted.

Enabling parameters

Parameters that have a code marked with an asterisk (*) can only be changed when they are enabled beforehand using Code ***3***.

The configuration mode is shown in the display with the ⇳ symbol.

See the code list on page 110 onwards or cover plate of the positioner for a description of the menu codes.

8.3 Initialization

Important!
*Perform a reset (Code **36**) prior to each initialization*

Turn ⊛ → Code ***3***, ↵

turn ⊛ → ON, ↵

turn ⊛ → Code ***36***, ↵

select ***RUN***, ↵

Caution!
During initialization, the valve moves through its whole range of travel/angle of rotation.

8.3.1 Simplest method (*MAX*)

*Mount and start up the positioner and press the **INIT key**!*
READY!
The positioner adapts itself automatically to the maximum travel/angle of rotation range of the control valve.

8.3.2 Precise method (*NOM*)

Positioner adapts itself precisely to the nominal travel/rotational angle of the control valve!

Mount and start up the positioner, then proceed as follows:

Turn ⊛ → Code ***3***, ↵

turn ⊛ → ***ON***, ↵

turn ⊛ → Code ***4***, ↵

turn ⊛ → Select pin position, ↵

turn ⊛ → Code ***5***, ↵

turn ⊛ → Enter nominal travel/range, ↵

turn ⊛ → Code ***6***, ↵

select ***NOM***, ↵

Press **INIT key!**

8.3.3 Manual method (MAN)

Initialization mode same as ***NOM***, but for start-up of control valves with unknown nominal ranges. The final position of travel/angle of rotation (valve open) is entered manually.

Mount and start up the positioner, then proceed as follows:

Turn ⊛ → Code ***0***, ↵,

turn ⊛ → select ***MAN***, ↵

turn ⊛ → Code ***1***, ↵,

turn ⊛ → valve **open** position, ↵

turn ⊛ → Code **3**, ↵,

turn ⊛ → ***ON***, ↵

turn ⊛ → Code ***6***, ↵, select ***MAN***, ↵

Press **INIT key!**

Note!
*After applying the electrical reference variable, the positioner is in the last used operating mode. Code **0** appears in the display. If the positioner has not yet been initialized, the ▮ symbol appears on the display and the ⚡ symbol blinks.*

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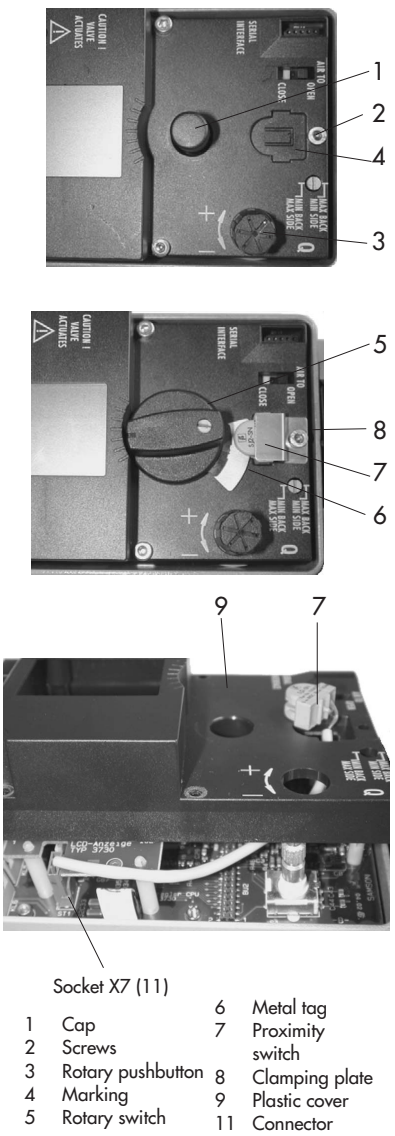
9 Retrofitting an inductive limit switch

Required retrofit kit:
Limit switch Order no. 1400-7460

Note! *For explosion-protected devices, the requirements in section 11 need to be kept.*

1. Take off the rotary pushbutton (3) and cap (1), unthread the five fixing screws (2) and lift off the plastic cover (9).
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 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. **Important!**
   On start-up of the positioner, set the option "inductive alarm" under Code ***38*** from ***NO*** to ***YES***.



1	Cap	6	Metal tag
2	Screws	7	Proximity switch
3	Rotary pushbutton	8	Clamping plate
4	Marking	9	Plastic cover
5	Rotary switch	11	Connector

Fig. 22 · 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 positioner on which the explosion protection is based needs to be serviced, the positioner must not be put back into operation until an expert has inspected the device according to explosion protection requirements, has issued a certificate stating this or given the device a mark of conformity.

Inspection by an expert 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.

Explosion-protected components may only be replaced by original, checked components from the manufacturer.

Devices that have already been used outside of hazardous areas and are intended for use in hazardous areas in future must comply with the safety demands placed on repaired devices. Prior to operation, they must be tested according to the specifications stipulated for "Repairing explosion-protected devices".

12 PROFIBUS-PA communication

The PROFIBUS-PA is a version for process automation based on the widely used PROFIBUS-DP. The transmission technique conforms with the IEC 61158-2 Standard and therefore fulfills the requirements for the type of protection, intrinsic safety.

PROFIBUS-DP defines two types of masters:

- **Class 1 master** exchanges the data with the configured slaves.
- **Class 2 master** is used for acyclic data exchange for commissioning and diagnostics purposes.

12.1 Profile

Basic device functions have been described in profiles by PNO (PROFIBUS user organization) to supplement the EN 50170 standard.
The scope of functions of the Type 3730-4 Positioner is consistent with Profile 3.01 with the extension "Condensed status and diagnostic messages V1.0".

12.2 Cyclic data exchange

Cyclically transmitted parameters

The following parameters that are transmitted in cyclic data transfer are marked with an asterisk (*) in the parameter lists from page 130 onwards.

- **POS_D**

Current position of the valve (discrete)
0: Not initialized
1: Closed (x < 0.5 %)
2: Open (x > 99.5 %)
3: Intermediate position

- **RCAS_IN**

Setpoint with status: Reference variable w in RCAS mode
Provided by a supervisory host, e.g. PID Block or master class 1. Depending on the mode of the function block.
Range of values defined in PV_SCALE

- **RCAS_OUT**

Setpoint with status: Reference variable w in RCAS mode
Provided to a supervisory host, z. B. PID Block or master class 1. Depending on the mode of the function block.
Range of values defined in PV_SCALE

- **READBACK**

Current position of the valve and status
Controlled variable x in relation to travel range/angle of rotation (OUT_SCALE)
Range of values defined in PV_SCALE

- **SP**

The setpoint SP is transmitted to the positioner. Defines the position of the valve between open and closed.
Range of values defined in PV_SCALE

- **DI_OUT**

Output of the DI Function Block

Status of device and measured value

- **Checkback**

Refer to section 12.3 for device status.

- **Status**

Consistent with the PROFIBUS-PA Profile, a status is assigned to every process value

Status of reference variable (hex):

0-3f	Bad
40-7f	Uncertain
80-bf	Good

Refer to section 12.4 for measured value status.

12.2.1 GSD files

The GSD (device database) file (SAMS071D.gsd) is used to integrate the SAMSON Type 3730-4 Positioner with PROFIBUS-PA communication into the programming and configuration environment of the master class 1 in standardized form. This GSD file contains defined data required for cyclic data exchange. Configuration telegrams are used to check the selected device settings.

12.2.2 Data exchange

The relationship between output and input is based on the control system/master class 1.

SLOT 1

Version 1: Module = SP
0x4A or 0x82, 0x84, 0x08, 0x05

Output

Byte 0	1	2	3	4
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
SP, value (Floating Point, IEEE)				Status

Version 2: Module = RCAS_IN, RCAS_OUT
0xC4, 0x84, 0x84, 0x08, 0x05, 0x08, 0x05

Output

Byte 0	1	2	3	4
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
RCAS_IN, value (Floating Point, IEEE)				Status

Input

Byte 0	1	2	3	4
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
RCAS_OUT, value (Floating Point, IEEE)				Status

Version 3: Module = SP, READBACK + POS_D
0xC6, 0x84, 0x86, 0x08, 0x05, 0x08, 0x05, 0x05, 0x05

Output

Byte 0	1	2	3	4
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
SP, value (Floating Point, IEEE)				Status

Input

Byte 0	1	2	3	4	5	6
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction	Octet 1	Octet 2
READBACK, value (Floating Point, IEEE)				Status	POS_D value	POS_D status

Version 4: Module = SP, CHECKBACK
0xC3, 0x84, 0x82, 0x08, 0x05, 0x0A

Output

Byte 0	1	2	3	4
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
SP, value (Floating Point, IEEE)				Status

Input

Byte 0	1	2
Octet 1	Octet 2	Octet 3
CHECK_ BACK[0]	CHECK_ BACK[1]	CHECK_ BACK[2]

Version 5: Module = SP, READBACK + POS_D + CHECKBACK
0xC7, 0x84, 0x89, 0x08, 0x05, 0x08, 0x05, 0x05, 0x05, 0x0A

Output

Byte 0	1	2	3	4
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
SP, value (Floating Point, IEEE)				Status

Input

Byte 0	1	2	3	4	5	6	7	8	9
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction	Octet 1	Octet 2	Octet 1	Octet 2	Octet 3
READBACK, value (Floating Point, IEEE)				Status	POS_D value	POS_D status	CHECK_ BACK[0]	CHECK_ BACK[1]	CHECK_ BACK[2]

Version 6: Module = RCAS_IN, RCAS_OUT + CHECKBACK
0xC5, 0x84, 0x87, 0x08, 0x05, 0x08, 0x05, 0x0A

Output

Byte 0	1	2	3	4
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
RCAS_IN, value (Floating Point, IEEE)				Status

Input

Byte 0	1	2	3	4	5	6	7
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction	Octet 1	Octet 2	Octet 3
RCAS_OUT, value (Floating Point, IEEE)				Status	CHECK_ BACK[0]	CHECK_ BACK[1]	CHECK_ BACK[2]

Version 7: Module = SP + RCAS_IN, READBACK + RCAS_OUT + POS_D + CHECKBACK
0xCB, 0x89, 0x8E, 0x08, 0x05, 0x08, 0x05, 0x08, 0x05, 0x08, 0x05, 0x05, 0x05, 0x0A

Output

Byte 0	1	2	3	4	5	6	7	8	9
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction	Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
SP, value (Floating Point, IEEE)				Status	RCAS_IN, value (Floating Point, IEEE)				Status

Input

Byte 0	1	2	3	4	5	6	7	8	9
Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction	Octet 1 Sign, Exponent	Octet 2 Exponent Fraction	Octet 3 Fraction	Octet 4 Fraction	Octet 5 Fraction
READBACK, value (Floating Point, IEEE)				Status	RCAS_OUT, value (Floating Point, IEEE)				Status
Byte 10	11	12	13	14					
Octet 1	Octet 2	Octet 1	Octet 2	Octet 3					
POS_D Wert	POS_D Status	CHECK_ BACK[0]	CHECK_ BACK[1]	CHECK_ BACK[2]					

SLOT 2, 3

Version 1: Module = Discrete Input (DI)
0x91

Input

Byte 0	1
Octet 1 Value	Octet 2 State
DI_OUT Wert	DI_OUT Status

12.2.3 Integration for PCS7 control system

The following steps must be observed on integrating the positioner into a Simatic S7 control system to ensure that the positioner functions properly:

1. The module in Slot 1 can be read out over the function component SFC 14 "DPRD_DAT" and, for example, assigned to a data module.
2. Existing modules in Slot 2 and/or Slot 3 need to be allocated over the MOVE command as the use of SFC 14 is not permissible in this case.

Note: *Data consistency is first provided from a data length of 3 bytes or 5 bytes.*
Use the MOVE command for data types BYTE, WORD and DWORD.
If the SFC 14 is to be used over several slots, do not forget that the data length is always to be regarded for each slot separately!

12.2.4 General instructions to start up the positioner

The positioner remains in the fail-safe position until it receives a valid setpoint from the process control system (status < 0x80). ***S*** blinks on the positioner display to indicate that the positioner is in the fail-safe position (see page 45). First when a valid set point (status ≥ 0x80) is set, the positioner leaves the fail-safe position and follows the reference variable.

12.3 CHECKBACK – Device status

Each bit can be masked individually for cyclic communication per class 2 master. This allows a targeted selection to be made from the existing alarms.

Byte	Bit	Name	Description	
0	0	CB_FAIL_SAFE	**Fail-safe position:** The fail-safe position has been triggered. This may have been caused by the local operation, activation of the SET_ FAIL_SAFE_POS option or due to a communication failure.	R
	1	CB_REQ_LOC_OP	**Request for local operation:** This is set when the initialization key INIT of the local operation is activated.	A
	2	CB_LOCAL_OP	**Local operation:** • The device has been set by the local operation into the MAN or SAFE mode. • The device is in the self-testing mode (initialization, zero point calibration or diagnostic function active). In this case, the CB_SELFTEST bit is also set.	R

Byte	Bit	Name	Description	
	3	CB_OVERRIDE	**Operating voltage for the optional built-in solenoid valve failed:** The positioner cannot function and moves to the fail-safe position determined by the actuator, regardless of the reference variable.	R
0	4…6	Not assigned		
0	7	CB_TRAVE_TIME	**Control loop error:** The control valve no longer follows the controlled variable in the tolerable times (see error code 57 on page 122). This alarm is reset after 10 seconds. The message CHECKBACK byte 1 bit 5 remains, in contrast, until it is confirmed.	A
1	0…1	Not assigned		
	2	CB_UPDATE_EVENT	**Static data changed:** This is set when the device data have been changed, resulting in the control of (unintended/ unauthorized) changes from the originally set values.	A
	3	CB_SIMULATE	**Simulation mode active:** This is set when the simulation mode of at least one Function Block is active. The simulation mode of the AO Function Block allows the controlled variable x to be simulated. The simulation mode of the DI Function Block allows the discrete output to be simulated.	R
	4	Not assigned		
	5	CB_CONTR_ERR	**Control loop error:** The control valve no longer follows the controlled variable in the tolerable times (see error code 57 on page 122). The error must be reset manually.	R
	6	CB_CONTR_INACT	**Positioner inactive:** This is set when the device is in the OUT OF SERVICE mode or the output of the AO Function Block has a bad status.	R
	7	CB_SELFTEST	**Device is in self-testing mode:** This is set when the initialization routine, the zero point calibration or a diagnostic function of the extended EXPERT+ valve diagnostics is active.	R

Byte	Bit	Name	Description	
2	0	CB_TOT_VALVE_TRAV	**Limit value for total valve travel exceeded:** The current value for the total valve travel is above the entered or predetermined limit. Reset over SELF_CALIB_CMD = 10 (Reset Total valve travel limit exceeded).	R
	1	CB_ADD_INPUT	**Status of the second optional integrated binary input:** The use of the second binary input must be configured correspondingly with CONFIG_BINARY_ INPUT2.	
	2…7	Not assigned		
	7	CB_ZERO_POINT_ERROR	**Zero point error** (see error code 58 on page 122)	R

R Static alarm remains active as long as the reason for the alarm still exists in the device
A Dynamic alarm is automatically set after 10 seconds

12.4 Status coding of measured values

The COND_STATUS_DIAG parameter in the Physical Block allows you to select whether the measured value status is communicated according to the Profile 3.01 or according to the Condensed Status extension.

12.4.1 Status alarm according to Profile 3.01

Fault/diagnostic alarm	**Value (hex)**	**Status alarm acc. to Profile 3.01**
Operational errors		
Device not initialized	0x1C	BAD_OUT_OF_SERVICE
Solenoid valve active	0x80	GOOD_NON_SPECIFIC
Total travel exceeded	0xA4	GOOD_MAINT_REQ
Control loop error	0x4A	GOOD_MAINT_REQ
Zero point error	0xA4	GOOD_MAINT_REQ
Autocorrection	0x80	GOOD_NON_SPECIFIC
Fatal error	0x0C	BAD_DEVICE_FAILURE
No emergency mode	0xA4	GOOD_MAINT_REQ
Reference test aborted	0x80	GOOD_NON_SPECIFIC
Temperature < –40 °C	0x80	GOOD_NON_SPECIFIC
Temperature > 80 °C	0x80	GOOD_NON_SPECIFIC

Fault/diagnostic alarm	Value (hex)	Status alarm acc. to Profile 3.01
Initialization errors		
x > range	0x80	GOOD_NON_SPECIFIC
Delta x < range	0x80	GOOD_NON_SPECIFIC
Incorrect attachment (mechanics/pneumatics)	0x80	GOOD_NON_SPECIFIC
Initialization time exceeded	0x80	GOOD_NON_SPECIFIC
Initialization/solenoid valve	0x80	GOOD_NON_SPECIFIC
Transit time too short	0x80	GOOD_NON_SPECIFIC
Pin position	0x80	GOOD_NON_SPECIFIC
Initialization running	0x80	GOOD_NON_SPECIFIC
Hardware errors		
x signal	0x0C	BAD_DEVICE_FAILURE
i/p converter	0x0C	BAD_DEVICE_FAILURE
Hardware	0x0C	BAD_DEVICE_FAILURE
Data memory	0xA4	GOOD_MAINT_REQ
Test calculation	0x0C	BAD_DEVICE_FAILURE
Program loading error	0x0C	BAD_DEVICE_FAILURE
Data errors		
Control parameter	0xA4	GOOD_MAINT_REQ
Poti parameter	0xA4	GOOD_MAINT_REQ
Calibration error	0xA4	GOOD_MAINT_REQ
Internal device error	0x0C	BAD_DEVICE_FAILURE
General parameters	0xA4	GOOD_MAINT_REQ
Options parameter	0xA4	GOOD_MAINT_REQ
Info parameter	0xA4	GOOD_MAINT_REQ
PA parameter	0xA4	GOOD_MAINT_REQ
Diagnostic parameter	0xA4	GOOD_MAINT_REQ

Fault/diagnostic alarm	Value (hex)	Status alarm acc. to Profile 3.01
Extended diagnostics – EXPERT+		
Air supply		
Perhaps modified TEST	0x80	GOOD_NON_SPECIFIC
Perhaps not enough TEST	0x80	GOOD_NON_SPECIFIC
Perhaps not enough	0x80	GOOD_NON_SPECIFIC
Working at full capacity	0x80	GOOD_NON_SPECIFIC
Working at full capacity TEST	0x80	GOOD_NON_SPECIFIC
Perhaps modified	0x80	GOOD_NON_SPECIFIC
Actuator springs		
Perhaps spring stiffness reduced TEST	0x80	GOOD_NON_SPECIFIC
Perhaps bias reduced TEST	0x80	GOOD_NON_SPECIFIC
Perhaps bias increased TEST	0x80	GOOD_NON_SPECIFIC
Working at full capacity	0x80	GOOD_NON_SPECIFIC
Working at full capacity TEST	0x80	GOOD_NON_SPECIFIC
Shifting working range		
Shifting working range close	0x80	GOOD_NON_SPECIFIC
Shifting working range open	0x80	GOOD_NON_SPECIFIC
Friction		
Much higher over whole range	0x80	GOOD_NON_SPECIFIC
Much lower over whole range	0x80	GOOD_NON_SPECIFIC
Much higher over partial range	0x80	GOOD_NON_SPECIFIC
Much lower over partial range	0x80	GOOD_NON_SPECIFIC
Much higher over whole range TEST	0x80	GOOD_NON_SPECIFIC
Much lower over whole range TEST	0x80	GOOD_NON_SPECIFIC
Much higher over partial range TEST	0x80	GOOD_NON_SPECIFIC
Much lower over partial range TEST	0x80	GOOD_NON_SPECIFIC
Leakage in pneumatics		
Perhaps existing TEST	0x80	GOOD_NON_SPECIFIC
Perhaps existing	0x80	GOOD_NON_SPECIFIC
Perhaps too large TEST	0x80	GOOD_NON_SPECIFIC

Fault/diagnostic alarm	Value (hex)	Status alarm acc. to Profile 3.01
Perhaps too large	0x80	GOOD_NON_SPECIFIC
Limit range		
Down	0x80	GOOD_NON_SPECIFIC
Up	0x80	GOOD_NON_SPECIFIC
Modification impossible	0x80	GOOD_NON_SPECIFIC
Dynamic stress factor		
Load factor > 90 %	0x80	GOOD_NON_SPECIFIC
Inner leakage		
Perhaps existing	0x80	GOOD_NON_SPECIFIC
Perhaps larger than in original state TEST	0x80	GOOD_NON_SPECIFIC
Perhaps larger than original state	0x80	GOOD_NON_SPECIFIC
External leakage		
Perhaps soon expected	0x80	GOOD_NON_SPECIFIC
Perhaps existing	0x80	GOOD_NON_SPECIFIC
Existing	0x80	GOOD_NON_SPECIFIC
Observing end position		
Zero point shift monotonously downwards, average value above reference lines	0x80	GOOD_NON_SPECIFIC
Zero point shift monotonously upwards, average value above reference lines	0x80	GOOD_NON_SPECIFIC
Zero point alternating, average value above reference lines	0x80	GOOD_NON_SPECIFIC
Zero point shift monotonously downwards, average value below reference lines	0x80	GOOD_NON_SPECIFIC
Zero point shift monotonously upwards, average value below reference lines	0x80	GOOD_NON_SPECIFIC
Zero point alternating, average value below reference lines	0x80	GOOD_NON_SPECIFIC
Connection positioner/valve		
No opt. travel transm. TEST	0x80	GOOD_NON_SPECIFIC
Perhaps loose	0x80	GOOD_NON_SPECIFIC
Perhaps limit. range	0x80	GOOD_NON_SPECIFIC
Perhaps loose TEST	0x80	GOOD_NON_SPECIFIC

Fault/diagnostic alarm	Value (hex)	Status alarm acc. to Profile 3.01
Range		
Mostly near closing position	0x80	GOOD_NON_SPECIFIC
Mostly near max. opening	0x80	GOOD_NON_SPECIFIC
Mostly closing position	0x80	GOOD_NON_SPECIFIC
Mostly max. opening	0x80	GOOD_NON_SPECIFIC
Temperature monitoring		
Lower limit exceeded	0x80	GOOD_NON_SPECIFIC
Higher limit exceeded	0x80	GOOD_NON_SPECIFIC
Reference run		
Reference test aborted	0x80	GOOD_NON_SPECIFIC
ESD		
Movement actuator possible –> Masking redundant	0x80	GOOD_NON_SPECIFIC
Movement actuator impossible	0x80	GOOD_NON_SPECIFIC
Error solenoid valve	0x80	GOOD_NON_SPECIFIC
Function activated		
Initialization active	0x80	GOOD_NON_SPECIFIC
Diagnostic function activated	0x80	GOOD_NON_SPECIFIC

12.4.2 Status alarms according to Profile 3.01 Condensed Status

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
Operational error					
Device not initialized	0x24	BAD_MAINT_ALARM		•	DIA_INIT_ERR
Solenoid valve active	0x80	GOOD_NON_SPECIFIC	•		–
Total valve travel exceeded	0xA4	GOOD_MAINT_REQ	•		DIA_MAINTENANCE
Control loop error	0xA4	GOOD_MAINT_REQ	•		DIA_MAINTENANCE
Zero point error	0xA4	GOOD_MAINT_REQ	•		DIA_ZERO_ERR
Autocorrection	0x80	GOOD_NON_SPECIFIC	•		DIA_MAINTENANCE DIA_MEM_CHECKSUM
Fatal error	0x24	BAD_MAINT_ALARM		•	DIA_HW_ELECTR

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
Extended diagnostics available	0x80	GOOD_NON_SPECIFIC		•	DIA_MAINTENANCE EXTENSION_AVAILABLE
No emergency mode	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Temperature < –40 °C	0x80	GOOD_NON_SPECIFIC	•		–
Temperature > 80 °C	0x80	GOOD_NON_SPECIFIC	•		–
Initialization error					
x > range	0xA4	GOOD_MAINT_REQ	•		DIA_INIT_ERR
Delta x < range	0xA4	GOOD_MAINT_REQ	•		DIA_INIT_ERR
Incorrect attachment (mechanics/pneumatics)	0xA4	GOOD_MAINT_REQ	•		DIA_INIT_ERR
Initialization time exceeded	0xA4	GOOD_MAINT_REQ	•		DIA_INIT_ERR
Solenoid valve initialization	0xA4	GOOD_MAINT_REQ	•		DIA_INIT_ERR
Transit time too short	0xA4	GOOD_MAINT_REQ	•		DIA_INIT_ERR
Pin position	0xA4	GOOD_MAINT_REQ	•		DIA_INIT_ERR
Initialization running	0xA4	GOOD_MAINT_REQ	•		–
Hardware error					
x signal	0xA8	GOOD_MAIN_DEMANDED	•		DIA_MEASUREMENT
i/p converter	0x24	BAD_MAINT_ALARM		•	DIA_HW_ELECTR
Hardware	0x24	BAD_MAINT_ALARM		•	DIA_HW_ELECTR
Data memory	0xA4	GOOD_MAINT_REQ		•	DIA_MEM_CHECKSUM
Test calculation	0x24	BAD_MAINT_ALARM		•	DIA_MEM_CHECKSUM
Program loading error	0x24	BAD_MAINT_ALARM		•	DIA_MEM_CHECKSUM
Data error					
Control parameter	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Poti parameter	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Calibration error	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Interal device error	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
General parameters	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Options parameters	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Info parameter	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
PA parameter	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Diagnostic parameter	0xA4	GOOD_MAINT_REQ	•		DIA_MEM_CHECKSUM
Extended diagnostics EXPERT+					
Air supply					
Perhaps modified TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps not enough TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps not enough	0x80	GOOD_NON_SPECIFIC	•		–
Working at full capacity	0x80	GOOD_NON_SPECIFIC	•		–
Working at full capacity TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps modified	0x80	GOOD_NON_SPECIFIC	•		–
Actuator springs					
Perhaps spring stiffness reduced TEST		GOOD_NON_SPECIFIC	•		–
Perhaps bias reduced TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps bias increased TEST	0x80	GOOD_NON_SPECIFIC	•		–
Working at full capacity	0x80	GOOD_NON_SPECIFIC	•		–
Working at full capacity TEST	0x80	GOOD_NON_SPECIFIC	•		–
Shifting working range					
Shifting working range close position	0x80	GOOD_NON_SPECIFIC	•		–
Shifting working range max. open	0x80	GOOD_NON_SPECIFIC	•		–
Friction					
Much higher over whole range	0x80	GOOD_NON_SPECIFIC	•		–
Much lower over whole range	0x80	GOOD_NON_SPECIFIC	•		–
Much higer over partial range	0x80	GOOD_NON_SPECIFIC	•		–
Much lower over partial range	0x80	GOOD_NON_SPECIFIC	•		–
Much higher over whole range TEST	0x80	GOOD_NON_SPECIFIC	•		–
Much lower over whole range TEST	0x80	GOOD_NON_SPECIFIC	•		–
Much higher over partial range TEST	0x80	GOOD_NON_SPECIFIC	•		–
Much lower over partial range TEST	0x80	GOOD_NON_SPECIFIC	•		–

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
Leakage pneumatics					
Perhaps existing TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps existing	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps too large TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps too large	0x80	GOOD_NON_SPECIFIC	•		–
Limit range					
Down	0x80	GOOD_NON_SPECIFIC	•		–
Up	0x80	GOOD_NON_SPECIFIC	•		–
Modification impossible	0x80	GOOD_NON_SPECIFIC	•		–
Dynamic stress factor					
Load factor > 90 %	0x80	GOOD_NON_SPECIFIC	•		–
Inner leakage					
Perhaps existing	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps larger than original state TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps larger than original state	0x80	GOOD_NON_SPECIFIC	•		–
External leakage					
Perhaps soon expected	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps existing	0x80	GOOD_NON_SPECIFIC	•		–
Existing	0x80	GOOD_NON_SPECIFIC	•		–
Observing end position					
Zero point shift monotonously downwards, average value above reference lines	0x80	GOOD_NON_SPECIFC	•		–
Zero point shift monotonously upwards, average value above reference lines	0x80	GOOD_NON_SPECIFIC	•		–
Zero point alternating, average value above reference lines	0x80	GOOD_NON_SPECIFIC	•		–
Zero point shift monotonously downwards, average value below reference lines	0x80	GOOD_NON_SPECIFIC	•		–
Zero point shift monotonously upwards, average value below reference lines	0x80	GOOD_NON_SPECIFIC	•		–

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
Zero point alternating, average value below reference lines	0x80	GOOD_NON_SPECIFIC	•		–
Connection positioner/valve					
No opt. travel transm. TEST	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps loose	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps limit. range	0x80	GOOD_NON_SPECIFIC	•		–
Perhaps loose TEST	0x80	GOOD_NON_SPECIFIC	•		–
Range					
Mostly near closing position	0x80	GOOD_NON_SPECIFIC	•		–
Mostly near max. opening	0x80	GOOD_NON_SPECIFIC	•		–
Mostly closing position	0x80	GOOD_NON_SPECIFIC	•		–
Mostly max. opening	0x80	GOOD_NON_SPECIFIC	•		–
Temperature monitoring					
Lower limit exceeded	0x80	GOOD_NON_SPECIFIC	•		–
Higher limit exceeded	0x80	GOOD_NON_SPECIFIC	•		–
Reference run					
Reference test aborted	0x80	GOOD_NON_SPECIFIC	•		–
ESD					
Movement actuator possible –> Masking redundant	0x80	GOOD_NON_SPECIFIC	•		–
Movement actuator impossible	0x80	GOOD_NON_SPECIFIC	•		–
Error solenoid valve	0x80	GOOD_NON_SPECIFIC	•		–
Function activated					
Initialization active	0xBC	GOOD_NON_SPECIFIC	• [1]		–
Diagnostic function active	0xBC	GOOD_NON_SPECIFIC	• [1]		–

[1] Can be classified between GOOD_FUNCTION_CHECK and BAD_FUNCTION_CHECK in firmware K1.10 and higher. See FEATURE_SELECT parameter on page 144.

12.5 Diagnostics with PROFIBUS-DP protocol

Generated alarms are classified and summarized in the PROFIBUS Profile 3.01 and "Condensed status and diagnostic messages" extension.

The diagnostic approach complying with PROFIBUS-DP includes the following types of diagnostic transfer:

- The DP master class 1 reads the diagnostics of the DP slave while the cyclic data exchange is being set up.
- In case of an active diagnostic alarm, the slave responds during the data exchange with a high-prioritized response telegram.
  The master requests a diagnosis as a result to continue afterwards with the normal data exchange.

The diagnostic alarm is composed of the standard diagnosis according to PROFIBUS DP and the user-specific diagnosis. The first six octets of the diagnostic alarm are assigned to the standard diagnosis, essentially providing a statement about the state of the cyclic connection. Special attention is given to the DIAG.ext bit (octet 1). The slave uses this bit to indicate to the master that the output data are invalid. As a result, the master interrupts the cyclic data exchange to read out the diagnostic data. The master first returns to cyclic data exchange when the DIAG.ext bit is reset by the slave.

If, however, the DIAG.ext bit is set to 0, the existing data are treated as status information by the system. For the Type 3730-4 Positioner, this behavior can be determined by the FEATURE_SELECT parameter. By selecting the option "DIA_MAINTENANCE_ALARM sets DIAG_EXT bit", the DIAG_EXT bit is set when the DIA_MAINTENANCE_ALARM bit has been determined. Deactivate this option if all the data of the positioner should be used as status information.

On using the Profile 3.01 the DIAG_EXT bit can be set when the measured value status has be assigned to BAD_DEVICE_FAILURE. This only happens when the following errors, which lead to device failure, occur:

- Test calculation
- Fatal error
- Program loading error
- No production calibration
- Hardware
- i/p converter

On using the "Condensed status and diagnostic messages" extension, the assignment can be selected as required.

The first four bytes of the manufacturer-specific diagnosis are used for diagnostic alarms according to Profile 3.01. On using the "Condensed Status and diagnostic messages" extension, these condensed diagnostic alarms are also included in these bytes. The manufacturer-specific diagnosis listed in the table below is transmitted in the eleventh byte and above. The contents of both parameters of the Physical Block, DIAGNOSIS and DIAGNOSIS_EXT, are sent.

Standard diagnosis according to Profibus DP

Regardless of whether the positioner was integrated according to Profile 3.01 or using manufacturer specifications, the diagnosis can be restricted to six bytes. For this purpose, the FEATURE_SELECT parameter provides the option "Use DP standard diagnosis (6 bytes)" (see page 144).
The default setting causes the positioner to provide a manufacturer-specific diagnosis of 26 bytes and a diagnosis of 14 bytes according to Profile 3.01.

Octet	Bit	Explanation	Note
1	0…7	Standard slave diagnostics	
2	0…7		
3	0…7		
4	0…7		
5	0…7		
6	0…7		
7	0…7	Definition of manufacturer-specific diagnostic alarms	
8	0…7		
9	0…7		
10	0…7		
11	0	DIA_HW_ELECTR (hardware fault in the electronics)	
	1	DIA_HW_MECH (hardware fault in the mechanics)	
	2	Not assigned	
	3	DIA_TEMP_ELECTR (temperature of electronics too high)	
	4	DIA_MEM_CHCKSUM (checksum error in data memory)	
	5	DIA_MEASUREMENT (error in measurement)	
	6	DIA_NOT_INIT (device not initialized/self-calibration not performed)	
	7	DIA_INIT_ERR (self-calibration faulty)	

Octet	Bit	Explanation	Note
12	0	DIA_ZERO_ERR (zero point error, final position)	
	1	–	
	2	DIA_CONF_INVAL (configuration invalid/invalid address)	
12	3	DIA_WARMSTART (restart-up/warm start performed)	
	4	DIA_COLDSTART (new start-up/cold start performed)	
	5	DIA_MAINTENANCE (maintenance required)	1
	6	DIA_CHARACT (characteristic invalid)	
	7	IDENT_NUMBER_VIOLATION (selected ID no. has not been implemented by the device yet)	
13	0	DIA_MAINTENANCE_ALARM (device error exists)	1
	1	DIA_MAINTENANCE_DEMANDED (maintenance demanded)	1
	2	DIA_FUNCTION_CHECK (device in function check, in simulation or in MODE_LO)	1
	3	Not assigned	
	4…7	Reserved in Profile 3.01	
14	0…6	Reserved in Profile 3.01	
	7	EXTENSION_AVAILABLE (further diagnostic information available)	
15 [3)]	0	Device not initialized	
	1	Solenoid valve active	
	2	Total valve travel limit exceeded (see Code 24)	
	3	Control loop (see Code 57)	
	4	Zero point (see Code 58)	
	5	Autocorrection (see Code 59)	
	6	Fatal error (see Code 60)	
	7	Extended diagnostics (only available with EXPERT+)	2
16 [3)]	0	x > permissible range (see Code 50)	
	1	Delta x < range (see Code 51)	
	2	Attachment (see Code 52)	
	3	Initialization time exceeded (see Code 53)	
	4	Initialization/solenoid valve (see Code 54)	
	5	Travel time too short (see Code 55)	
	6	Pin position (see Code 56)	

Octet	Bit	Explanation	Note
16 [3]	7	Test or calibration running	
17 [3]	0	x signal (see Code 62)	
	1	i/p converter (see Code 64)	
	2	Hardware (see Code 65)	
	3	Control parameter (see Code 68)	
	4	Poti parameter (see Code 69)	
	5	Adjustment parameter (see Code 70)	
	6	Internal device error 1 (see Code 73)	
	7	General parameter (see Code 71)	
18 [3]	0	No emergency mode (see Code 76)	
	1	Program load error (see Code 77)	
	2	Options parameter (see Code 78)	
	3	Info parameter (see Code 75)	
	4	Data memory (see Code 66)	
	5	Control calculation (see Code 67)	
	6	PA parameter (see Code 74)	
	7	DIAG parameter (see Code 80)	
19 [3]	0	Reset communication controller	
	1	Reset SPC4 (reset: bus link alarm)	
	2	Binary input 2 deactivated	
	3	Reset application controller	
	4…7	Not assigned	
20 [3]	0	Air supply: Perhaps modified (TEST)	2
	1	Air supply: Perhaps not enough (TEST)	2
	2	Air supply: Perhaps not enough	2
	3	Air supply: At full capacity	2
	4	Air supply: At full capacity (TEST)	2
	5	Air supply: Perhaps modified	2
	6	Actuator spring: Stiffness reduced (TEST)	2
	7	Actuator spring: Pretensioning reduced (TEST)	2

Octet	Bit	Explanation	Note
21 [3]	0	Actuator spring: Perhaps pretensioning increased (TEST)	2
	1	Actuator spring: Working at full capacity	2
	2	Actuator spring: Working at full capacity (TEST)	2
	3	Shifting working range: Close	2
	4	Shifting working range: Open	2
	5	Friction: Higher over whole range	2
	6	Friction: Lower over whole range	2
	7	Friction: Higher over partial range	2
22 [3]	0	Friction: Lower over partial range	2
	1	Friction: Higher whole range (TEST)	2
	2	Friction: Lower whole range (TEST)	2
	3	Friction: Higher over partial range (TEST)	2
	4	Friction: Lower over partial range (TEST)	2
	5	Leakage in pneumatics: Perhaps existing (TEST)	2
	6	Leakage in pneumatics: Perhaps existing	2
	7	Leakage in pneumatics: Too large (TEST)	2
23 [3]	0	Leakage in pneumatics: Perhaps too large	2
	1	Limit range: Down	2
	2	Limit range: Up	2
	3	Limit range: Modification not possible	2
	4	Dynamic stress factor > than 90 %	2
	5	Inner leakage: > as originally	2
	6	Inner leakage: > as originally (TEST)	2
	7	Inner leakage: Perhaps present	2
24 [3]	0	External leakage: Perhaps soon to be expected	2
	1	External leakage: Perhaps existing	2
	2	External leakage: Existing	2
	3	Zero point shift monotonously downwards, average value above reference lines	2
	4	Zero point shift monotonously upwards, average value above reference lines	2
	5	Zero point shift alternating, average value above reference lines	2

Octet	Bit	Explanation	Note
24 [3]	6	Zero point shift monotonously downwards, average value below reference lines	2
	7	Zero point shift monotonously upwards, average value below reference lines	2
25 [3]	0	Zero point shift alternating, average value below reference lines	2
	1	Attachment between positioner and valve: Travel transmission not optimal (TEST)	2
	2	Attachment between positioner and valve: Perhaps loose	2
	3	Attachment between positioner and valve: Perhaps working range limited	2
	4	Attachment between positioner and valve: Perhaps loose (TEST)	2
	5	Working range: Mostly near closing position	2
	6	Working range: Mostly near max. opening	2
	7	Working range: Mostly closing position	2
26 [3]	0	Working range: Mostly max. opening	2
	1	Temperature below –40 °C	2
	2	Temperature above +80 °C	2
	3	Reference test aborted	2
	4	ESD: Movement actuator possible	2
	5	ESD: Movement actuator not possible	2
	6	ESD: Error solenoid valve	2
	7	Not assigned	2

[1] Only on using the profile extension "Condensed Status und diagnostic messages"
The following diagnostic alarms indicate the condensed status (refer to section 6.3):

DIA_MAINTENANCE_ALARM	Maintenance alarm
DIA_MAINTENANCE_DEMAND	Maintenance demanded
DIA_MAINTENANCE	Maintenance required
DIA_FUNCTION_CHECK	Function check

[2] Diagnostic alarm of the extended EXPERT$^+$ diagnostics

[3] The default setting causes the positioner to provide a manufacturer-specific diagnosis of 26 bytes and a diagnosis of 14 bytes according to Profile 3.01.

12.6 Acyclic data exchange

Note: *All parameters in the parameter list on page 130 onwards, which are not marked, are included in the acyclic data exchange.*

The acyclic data exchange complying to DP-V1 with a master class 2 (MS2) is mainly used for commissioning, parameter configuration and for diagnostic purposes.
The Device Description can be downloaded at the SAMSON Internet site (www.samson.de) to configure parameters in Type 3730-4 Positioner over Siemens PDM (Process Device Manager). Some parameters make it necessary to use the new DD revision 2 for firmware version K 1.11/R 1.45 and higher.

13 Settings in TROVIS-VIEW software

13.1 General

The TROVIS-VIEW software allows various smart SAMSON devices to be configured over a common operator interface. It consists of the operator interface, communication server, and the device-specific module. The software has a Windows® Explorer look and feel.
The entire configuration of the positioner can be performed over the TROVIS-VIEW Configuration and Operator Interface. It is not possible to link function blocks of other devices with the TROVIS-VIEW software.
The TROVIS-VIEW software containing online help and the database module for Type 3730-4 Positioner is delivered on a CD-ROM.
Software updates are available in Internet (http://www.samson.de) in Products > Support and downloads.

Note!
The following instructions include a description on the key functions of the TROVIS-VIEW software in conjunction with Type 3730-4 Positioner. Refer to the online help in the ? menu for a detailed description.

13.1.1 System requirements

Hardware requirements

- PC with Pentium II processor or equivalent (300 MHz or higher), 500 MHz recommended
- Serial interface or USB/RS-232 adapter
- Min. 96 MB RAM, 192 MB RAM recommended
- Min. 150 MB free hard disk space plus approx. 10 to 15 MB additional hard disk space per SAMSON module
- SVGA graphic card (min. 800 x 600)
- CD-ROM drive

Software requirements

- Operating system: Windows® 2000 (min. SP2), Windows® XP, Windows® Vista
- Microsoft .NET Framework Version 2.0 or higher (included on the installation CD-ROM)
- Internet browser: Microsoft Internet Explorer, version 6.0 and higher

Accessories

- Serial interface adapter, order no. 1400-7700

13.2 Installing TROVIS-VIEW software

1. Insert the installation CD-ROM to start the installation program.
   Once inserted, the CD-ROM usually starts the installation program automatically, depending on the configuration of the operating system. If the program does not start automatically, double-click setup.exe in the root directory of the CD-ROM in order to install TROVIS-VIEW.
2. Follow the on-screen prompts and instructions of the installation program.

The TROVIS-VIEW Operator Interface can be used for different SAMSON devices. Note that the installation program also offers you the option of installing a demo module. To use the software without restrictions, the software needs to be activated by entering a CD key as follows:

3. After installation, a dialog box will appear, prompting you to enter the CD key, which you will find on the cover of the original CD-ROM.
   Once you have entered the correct CD key, an activation is necessary. The software can be activated automatically or manually. Internet access on the computer on which TROVIS-VIEW is installed is required for automatic activation.

Manual activation:
Once you have entered the correct CD key, a request code will be automatically generated and displayed which contains computer identification details.

- Enter request code in SAMSON's product activation server over the Internet. (http://support.samson-ag.com:8082/activate_eng.html)
  An activation code is generated which allows TROVIS-VIEW to be used without any restrictions in the purchased scope.
- Enter this activation code in TROVIS-VIEW.
  The TROVIS-VIEW software is now ready for use.

Automatic activation:
A request code containing the computer identification details is transferred to the SAMSON product activation server when an Internet connection is active and an activation code is automatically entered into TROVIS-VIEW.
The TROVIS-VIEW software is now ready for use.

Note: *Refer to the readme.txt file in the root directory of the CD-ROM for further information on installation, software updates and current system requirements.*

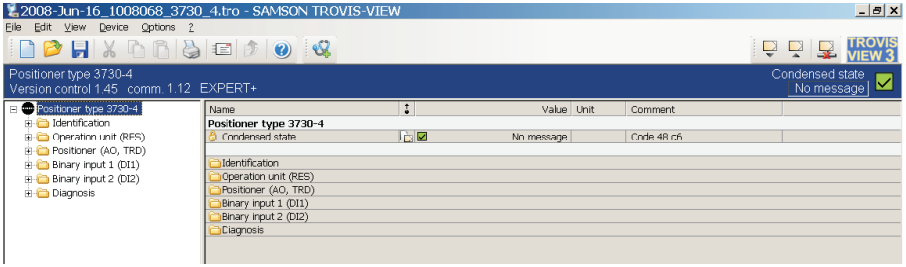
13.3 Starting TROVIS-VIEW and performing basic settings

You can perform the settings in TROVIS-VIEW either when the positioner is connected (online) to the computer or not connected (offline).

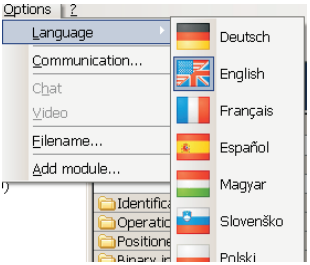
Note: *When the positioner is not connected, the default settings appear on the operator interface or, alternatively, a stored TROVIS-VIEW file (*.tro) can be loaded and overwritten by selecting* Open *in the* File *menu.*

---

1. Start TROVIS-VIEW. The operator interface appears with menubar and toolbar as well as various folders.

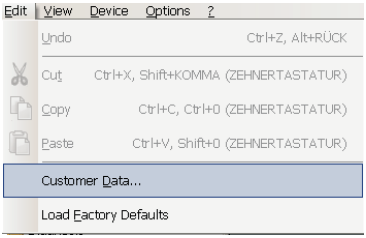


2. In *Options* menu, select *Language* to change the interface language.

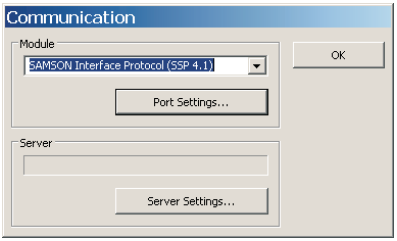


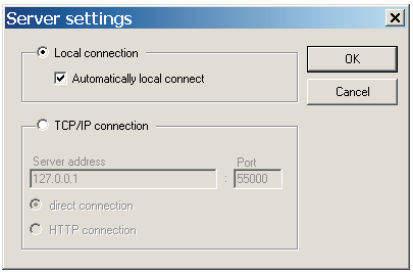
3. Select *Customer data* in, *Edit* menu to enter data relevant to the plant, e. g. project name, plant location, operator.

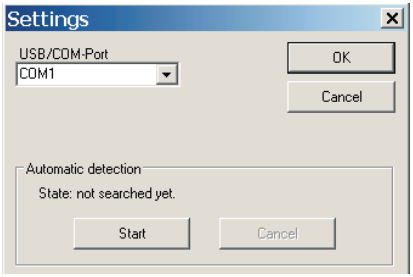
4. Select *Load Factory Defaults* in *Edit* menu if you want to load default settings (see code list in section 14.1) onto the operator interface.



5. Set the communications port for data communication. Proceed as follows:
   - Connect the serial port of the computer using the serial interface adapter (order no. 1400-7700) to the serial interface connection of the positioner.
     In case the computer does not have a serial port, a USB/RS-232 adapter (order no. 8812-0016) can be used.
   - Select *Communications* in *Options* menu to open the server settings window. Click *Server settings* button.
   - Check *Local connection* and *Automatically local connect* boxes and click *OK* button to confirm server settings.
     The *Communication* window reappears.
   - Click *Port settings* button.
   - The settings window opens and *State: not yet searched* appears in the Automatic detection field.
     Click *Start* button.
     TROVIS-VIEW has found the positioner when *State: Device found on COM ....* appears.
   - Click on *OK* button twice to confirm settings.







6. If required, add a new TROVIS-VIEW module by selecting *Add module* in the *Options* menu. Enter the CD key (written on the installation CD-ROM) in the open window.
7. If required, enter the type, date and selectable parameters which are used to automatically create the TROVIS-VIEW file name.
   The file name created in this way appears on saving a TROVIS-VIEW file (e.g. VIEW3_3730_4.tro) and can be adopted or altered.

Converting the software version

The TROVIS-VIEW software version must match the firmware of the positioner.

On exchanging data between the positioner and TROVIS-VIEW, the software automatically checks whether the versions are compatible and, if necessary, converts the data.

If you want to adapt the firmware version without exchanging any data, proceed as follows:

1. Select *Convert* in the *File* menu.
   A window with a drop-down list of all the available firmware versions appears.
2. Select the corresponding version.
3. Click on *OK* button to confirm the selected version.

Note: *The TROVIS-VIEW software version for communication with EXPERT+ applies for all positioners in which the extended valve diagnostics option has been activated.*
The EXPERT+ extended valve diagnostics is an optional diagnostic software integrated in the positioner which allows predictive, status-oriented maintenance of pneumatic control valves. An activation code is required which needs to be ordered to activate this option.

13.4 Data transmission

Settings performed in the operator interface can be made both when the positioner is connected or not connected. When the positioner is connected, data uploaded from the positioner can be overwritten.
The default setting appear on the operator interface when no positioner is connected. A stored TROVIS-VIEW file (*.tro) can be loaded and overwritten by selecting *Open* in the *File* menu.

Connection to the positioner can also be made by clicking the icons on the top right in the device toolbar:

- Data from the positioner are uploaded and shown in the operator interface.
- The complete set of data is downloaded to the positioner from the operator interface. To transfer individual parameters, open the corresponding context-sensitive menu. Select *Write* to just download the selected parameter, refer to section 13.4.3.
- The positioner is in the online mode, indicated by the TROVIS-VIEW 3 logo on the top right in blue.
- The positioner is in the offline mode.

The listed functions can be activated in the *Device* menu.

Important! *Perform the electrical connection as described in section 3.2 first before downloading any data to the positioner.*

13.4.1 Offline operation (indirect data transmission)

In offline mode, there is no constant data communication between the computer and positioner. Communication must first be established to upload data from the positioner and download data to the positioner.

- **Downloading data to the positioner:** Select *Download to the device* in *Device* menu to transfer data to the positioner. The control task is implemented after data are downloaded from TROVIS-VIEW.
- **Uploading data from the positioner:** Select *Upload from device* in *Device* menu to transfer all the data from the positioner. Uploaded data are indicated in TROVIS-VIEW by the icon.

Note: *Data transmission can also be performed by clicking the icons in the device toolbar: click to download data from TROVIS-VIEW to the positioner and, click to upload data from the positioner and to display them in TROVIS-VIEW.*

13.4.2 Online operation (constant data transmission)

The positioner and TROVIS-VIEW are constantly connected in online operation. Current configuration and operating data are uploaded from the positioner cyclically and displayed in TROVIS-VIEW. Likewise, any settings performed in TROVIS-VIEW are directly transferred to the positioner.

- **Activate online operation:** Select *Online* in *Device* menu to activate online mode. In online mode, TROVIS VIEW 3 on the device toolbar is animated.
- **Deactivate online operation:** Select *Online* in *Device* menu while the online mode is activated. The online mode is canceled.

Note: *Alternatively, click on the device toolbar to activate and deactivate online operation.*

Operational data graphs (Trend Viewer)

In online mode, process data (positioning value TRD, actual valve position and set point deviation [e]) are plotted in a graph over time. Select *Trend Viewer* in the *View* menu. You can modify the graphs, for example, by adding data points that should be recorded, or even remove data points. Right-click on the graph to save the analysis in a file.

Note: *Drag and drop other data points in the Trend Viewer to add them.*

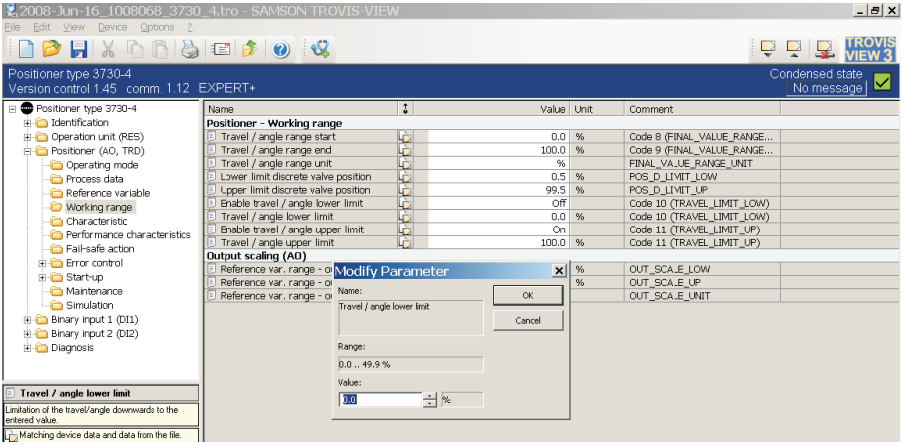
13.4.3 Setting parameters

Properties of data points are indicated by icons on clicking on a folder:

Icon	Meaning
	Data cannot be changed
	Data can be changed
	Data point can be executed
	Data point is user-defined
	Mark to indicate status/error
	Value has exceeded maximum limit
	Value has fallen below minimum limit
Source of data:	
	Value has been modified manually
	Value has been uploaded from the positioner. In online mode,  in the icon indicates a value has been updated.
	Value originates from a stored file

Parameters are data points whose settings can be changed. They are marked by the  icon. Their settings can be made either in online or offline mode.

1. Click on one of the folders in the left tree directory to view the parameter settings on the right. Place the cursor over a data point to open a tool tip providing more information on the parameter.



2. Double-click the required parameter to open a pop-up window to modify parameter setting.
   Right-click the required parameter to open pop-up window to modify parameter settings:
   Modify Opens pop-up window to modify parameter settings.
   Read Uploads parameter value from device.
   Write Downloads parameter value to device.
   Default: ... Resets parameter to default setting (setting in gray to indicate that the parameter value is the same as the default setting)
   Min ... Set parameter to the displayed minimum value.
   Max ... Set parameter to the displayed maximum value

Note: *Refer to the code list (section 14.1 on page 110 onwards) for descriptions of each parameter.*
The code number assigned to a parameter is listed in the Comment column in TROVIS-VIEW.

13.5 Initializing the positioner

Initializing the positioner is only possible in TROVIS-VIEW when the positioner has been attached properly to the control valve and has been connected (see sections 2 and 3). The positioner must be connected to the computer over the serial interface adapter.
The positioner does not need to be connected to a PROFIBUS segment. It just needs to be supplied over the bus terminals with an electrical power supply (9 to 32 V DC).

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

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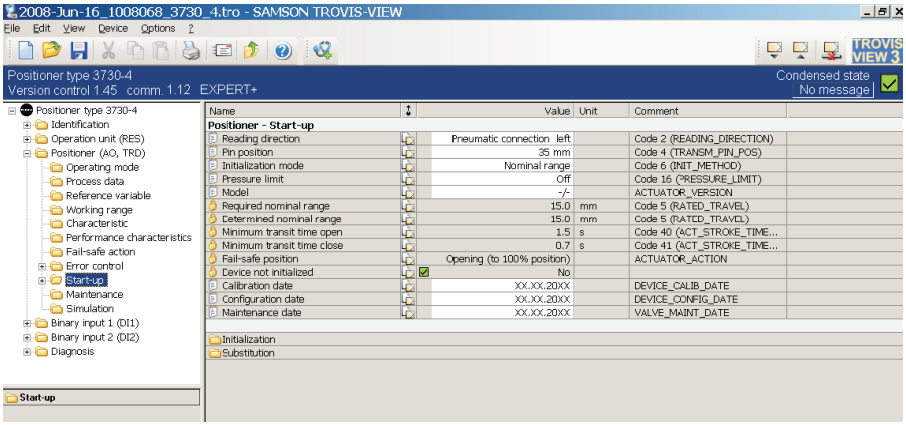
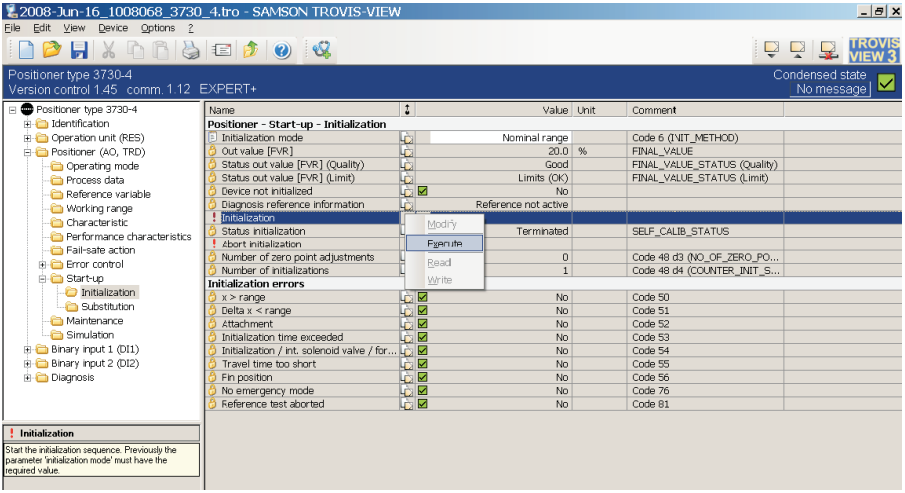
1. Change parameter settings in *Start-up* subfolder in Positioner folder.



2. Select the initialization type under *Initialization* (maximum range, nominal range, manual adjustment, substitute) in the *Positioner* folder in the *Start-up* subfolder.



3. Start initialization by right-clicking *Initialization* and selecting *Execute*.
   How long the initialization procedure lasts depends on the actuator transit time and may take a few minutes.

14 Appendix

14.1 Code list

Code no.	**Parameter** – Display, values [default setting]	Description
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
0	**Operating mode** [MAN] AUtO SAFE ESC	AUtO = Automatic mode MAN = Manual mode SAFE = Fail-safe position ESC = Escape Switchover from automatic to manual mode is smooth. In fail-safe mode, the symbol **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	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 °.
2	**Reading direction** [Normal], upside down, ESC	The reading direction of the display is turned by 180°.
3	**Enable configuration** [OFF] ON ESC	Enables the option to modify data (automatically deactivated when the rotary pushbutton has not been operated for 120 s.) ***PA*** blinks on the display when the on-site operation over PROFIBUS-PA communication 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** – Display, values [default setting]	**Description**
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
4*	**Pin position** 17, 25, 35, 50, 70, 100, 200 mm 90° with rotary actuators [OFF], 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	For initialization using NOM or SUb, the follower pin must be inserted into the correct pin position according to the valve travel/angle of rotation. Pin position Code 4 / Standard Code 5 / 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 110.0
5*	**Nominal range** 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: Maximum range of the control valve, the travel/angle of the closure member from the CLOSED position to the opposite stop in the actuator. NOM: Nominal range of the control valve, the travel/angle of the closure member measured from the CLOSED position to the indicated OPEN position. MAN: Manual adjustment: upper x-range value SUb: No self-adjustment (emergency mode) ZP: Zero calibration

Code no.	**Parameter** – Display, values [default setting]	**Description**
Important! 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*	**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*	**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*	**Lower x-limit** 0.0 to 49.9 % of the operating range [OFF], 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** – Display, values [default setting]	Description
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
11*	**Upper x-limit** 50.0 to 120.0 [100] % of the operating range OFF, 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 OFF, the valve can be opened past the nominal travel with a reference variable outside of the 0 to 100 % range.
14*	**Final position w <** 0.0 to 49.9 [1.0] % of the span adjusted via Code 12/13 OFF, 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.
15*	**Final position w >** 50.0 to 100.0 % of the span adjusted via Code 12/13 [OFF], 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. Example: Set the final position w > to 99 % for three-way valves.
16*	**Pressure limit** 1.4 2.4 3.7 bar [OFF], ESC	The pressure limit determined during initialization is displayed and can be changed. (Only for fail-safe position valve closed/AIR TO OPEN, for valve open/AIR TO CLOSE, always set it to ***OFF*** after initialization, i.e. complete supply pressure to the actuator. The signal pressure can also be limited already prior to initialization to protect against impermissibly high actuating forces). **Note**: After changing a pressure limit already set, the actuator must be vented once (e.g. by selecting the fail-safe position over Code 0). The pressure limit must always be set to ***OFF*** after initialization for double-acting actuators.

Code no.	**Parameter** – Display, values [default setting]	**Description**
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
17*	**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. **CAUTION**! Changing the K_P step influences the system deviation.
18*	**TV step** 1 [2] 3 4 OFF OFF, 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.
19*	**Tolerance band** 0.1 to 10.0 [5] % 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: Butterfly valve linear 4: Butterfly valve eq. percentage 5: Rotary plug valve linear 6: Rotary plug valve eq. perc. 7: Segmented ball valve linear 8: Segmented ball valve eq. p. 9: User-defined * * Definition over SAMSON TROVIS-VIEW software or PROFIBUS-PA communication

Code no.	**Parameter** – Display, values [default setting]	Description
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
21*	**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. Note! The function is not activated when the fail-safe function or solenoid valve is triggered nor upon failure of the auxiliary power.
22*	**w-ramp Closed** [0] to 240 s ESC	The time required to pass through the operating range when the valve closes. Note! The function is not activated when the fail-safe function or solenoid valve is triggered nor upon failure of the auxiliary power.
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 via *RES*. **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, the fault symbol and the wrench symbol appear.
34*	**Closing direction** CL Clockwise [CCL] Counterclockwise ESC	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. Only necessary in initialization mode *SUb*.

Code no.	**Parameter** – Display, values [default setting]	**Description**
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
36*	**Reset** [OFF], RUN, ESC	Resets all parameters to default (factory setting). **Note:** After setting ***RUN***, the positioner must be re-initialized.
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 position required.
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/Man-w info** 0.0 to 100.0 % of the span	Display only, Auto mode: indicates the supplied automatic reference variable Man mode: indicates the supplied manual reference variable
43	**Firmware info** Control	Display only, indicates the positioner type and the current firmware version in alternating sequence.
44	**y info** [0] to 100 % 0P, 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. 0P: The positioner vents completely, see description in Code 14 and 15. – – –: The positioner is not initialized.
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, *YES* and *HIGH* 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 symbol), *YES* and *LOW* appear on the display in alternating sequence.

Code no.	**Parameter** – Display, values [default setting]	Description
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
46*	**Bus address** ESC	In delivered state, the standard bus address is 126. The address can only be changed with the PROFIBUS command SET_ADRESS when this bus address is set. Alternatively, the bus address setting can be performed directly at the positioner (refer to section 5.11).
47*	**Write protection PA** YES, [NO], ESC	When the write protection function is activated, device data can only be read, but not overwritten over PROFIBUS-PA communication.
48*	**Diagnostic parameters d**	
	d0 Current temperature –55 to 125	Operating temperature [°C] inside the positioner
	d1 Minimum temperature [20]	The lowest temperature below 20 °C that has ever occurred.
	d2 Maximum temperature [20]	The highest temperature above 20 °C that has ever occurred.
	d3 Number of zero calibrations	The number of zero calibrations since the last initialization.
	d4 Number of Initializations	The number of initializations that have been performed.
	d5 Zero point limit 0.0 to 100.0 % [5 %]	Limit for the zero point monitoring.
	d6 Condensed status	Condensed status, made up from the individual states. 0 OK: Okay 1 C: Maintenance required 2 CR: Maintenance demanded 3 B: Maintenance alarm 7 I: Function check
	d7 Start reference run [OFF], ON, ESC, 1	Triggering of a reference run for the functions: Drive signal y steady-state and drive signal y hysteresis. The reference run can only be activated in manual operating mode as the valve moves through its entire travel range. If EXPERT+ is activated at later point in time, the reference graphs must be plotted in order to activate the diagnostic functions.

Code no.	**Parameter** – Display, values [default setting]	**Description**
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
48*	**d8** EXPERT+ activation	Enter the activation code for EXPERT+. After the activation procedure has been successfully completed, ***YES*** appears under d8.
	PA parameters PA-P	
	F0 Firmware Rev. Communication	
	F1 Binary input1	1 Active 0 Inactive
	F2 Binary input2	1 Active 0 Inactive
	F3 Counter device start-ups	
	F4 Counter reset communication	
	F5 Counter reset control	
	F6 Counter reset bus connection	
	F7 Slave status	0 Undefined 2 wait_cfg 1 wait_prm 3 data_exchg
	AO Function Block A	
	A0 Target Mode	Required operating mode
	A1 Actual Mode	Actual operating mode
	A2 SP Value	Displays the setpoint (reference variable)
	A3 SP Status	and its status
	A4 Readback Value	Displays the current position
	A5 Readback Status	and its status
	A6 Out Value	Displays the manipulated variable (output value)
	A7 Out Status	and its status
	A8 Unassigned	
	A9 Simulate	Positioner simulation 1 Enabled 0 Disabled

Code no.	**Parameter** – Display, values [default setting]	Description
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
48*	**Transducer Blocks A0, DI1, DI2 t**	
	t0 Target Mode AO Trd	Required operating mode
	t1 Actual Mode AO Trd	Actual operating mode
	t2 Final_Position_Value. Value	Displays the current valve position in relation to the operating position
	t3 Final_Position_Value. State	and its status
	t4 AO Feedback Value	Displays the current valve position [OUT_SCALE]
	t5 AO Feedback State	and its status
	t6 AO Final_Value.Value	Displays the output value [FVR]
	t7 AO Final_Value.State	and its status
	t8 AO Final_Position_ Value.Value	Displays the current valve position [FVR]
	t9 AO Final_Position_ Value.State	and its status
	Resource Block S	
	S0 Resource Target Mode	Required operating mode
	S1 Resource Actual Mode	Actual operating mode
	DI1Function Block I	
	I0 Target Mode DI1	Required operating mode
	I1 Actual Mode DI1	Actual operating mode
	I2 DI1 Trd PV_D.Value	Displays the discrete input variable
	I3 DI1 Trd PV_D.State	and its status
	I4 DI1 Fb Target Mode	Required operating mode FB
	I5 DI1 Fb Actual Mode	Actual operating mode FB
	I6 DI1 Fb OUT_D.Value	Displays the discrete output variable
	I7 DI1 Fb OUT_D.State	and its status

Code no.	**Parameter** – Display, values [default setting]	Description
Important! Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
48*	**I8** DI1 FSAFE_VAL_D	Default value when the sensor reports an error
	I9 Simulate	Simulation
	D2 Function Block L	
	L0 Target Mode DI2	Required operating mode
	L1 Actual Mode DI2	Actual operating mode
	L2 DI2 Trd PV_D.Value	Displays the discrete input variable
	L3 DI2 Trd PV_D.State	and its status
	L4 DI2 Fb Target Mode	Required operating mode FB
	L5 DI2 Fb Actual Mode	Actual operating mode FB
	L6 DI2 Fb OUT_D.Value	Displays the discrete output variable
	L7 DI2 Fb OUT_D.State	and its status
	L8 DI2 FSAFE_VAL_D	Default value when the sensor reports an error
	L9 Simulate	Simulation

Error codes – Recommended action		Condensed status alarm active, when prompted, ***Err*** appears.
Initialization errors (indicated on the display by the condensed status with the corresponding classification)		
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. • Pin positioned incorrectly. • Bracket slipped in case of NAMUR attachment or positioner is not central. • Follower plate incorrectly attached.
	Recommended action	Check attachment and pin position, set operating mode from SAFE to MAN and re-initialize the positioner.
51	**Δx > range**	The measuring span of the sensor is too low. • Pin positioned incorrectly. • Wrong lever. A rotational angle smaller than 11° at the positioner shaft creates just an alarm. An angle below 6° leads to the initialization being canceled.
	Recommended action	Check attachment and re-initialize the positioner.
52	**Attachment**	• Positioner attachment incorrect. • Nominal travel/angle (Code 5) could not be achieved during initialization under NOM (no tolerance downwards permissible). • Mechanical or pneumatic error, e.g. wrong lever selected or supply pressure too low to move to the required position or pneumatic fault.
	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.
53	**Init time >**	The initialization routine lasts too long. The positioner returns to its previous operating mode. • No pressure on the supply line or there is a leak. • Supply air failure during initialization.
	Recommended action	Check attachment and supply pressure. Re-initialize the positioner.

Error codes – Recommended action		Condensed status alarm active, when prompted, ***Err*** appears.
54	**Init – 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).
	Recommended action	Re. 1) Check connection and supply voltage of the solenoid valve. Code 45 High/Low Re. 2) Set the ***MAN*** operating mode over Code 0. Then initialize the positioner.
55	**Transit time <**	The actuator transit times determined during the initialization are so short that the positioner cannot adapt itself optimally.
	Recommended action	Check the volume restriction setting as described in section 4.1, re-initialize the positioner.
56	**Pin pos.**	Initialization was canceled because you are required to enter the pin position for the selected initialization modes ***NOM*** and ***SUb***.
	Recommended action	Enter pin position over Code **4** and nominal travel/angle over Code **5**. Re-initialize the positioner.
Operational errors (indicated on the display by the condensed status with the corresponding classification)		
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). • Actuator mechanically blocked. • Attachment of the positioner subsequently postponed. • Supply pressure not sufficient.
	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.
	Recommended action	Check valve and mounting of the positioner. If OK, perform a zero calibration over Code 6 (see section 5.8 on page 61). We recommend re-initializing the positioner in case of deviations in the zero point over 5 %.

Error codes – Recommended action		Condensed status alarm active, when prompted, ***Err*** appears.
59	**Autocorrection**	Should an error occur in the data range of the positioner, the self-monitoring function recognizes it and automatically corrects it.
	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 control valve moves to its fail-safe position.
	Recommended action	Reset over Code 36. Re-initialize the positioner.
Hardware errors (indicated on the display by the condensed status with the corresponding classification)		
62	**x signal**	Determination of the measured value 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 control symbol and 4 dashes instead of the position indication. Note on the control: 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.
	Recommended action	Return the positioner to SAMSON AG for repair.
64	**i/p converter** (y)	The circuit of the i/p converter has been interrupted.
	Recommended action	Cannot be remedied. Return the positioner to SAMSON AG for repair.
Error appendix		
65	**Hardware**	A hardware error has occurred, the positioner moves to the fail-safe position ***SAFE***.
	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.

Error codes – Recommended action		Condensed status alarm active, when prompted, ***Err*** appears.
66	**Data memory**	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.
	Recommended action	Return the positioner to SAMSON AG for repair.
67	**Test calculation**	The hardware positioner is monitored by means of a test calculation.
	Recommended action	Confirm error. If this is not possible, return the positioner to SAMSON AG for repair.
Data errors		
68	**Control parameter**	Control parameter error
	Recommended action	Confirm error, perform reset and re-initialize the positioner.
69	**Poti parameter**	Parameter error of the digital potentiometer.
	Recommended action	Confirm error, perform reset and re-initialize the positioner.
70	**Calibration**	Error in the production calibration data. Subsequently, the device runs on default values
	Recommended action	Return the positioner to SAMSON AG for repair.
71	**General parameters**	Parameter errors that are not critical for the control.
	Recommended action	Confirm error. Check and, if necessary, reset required parameters.
73	**Internal device error 1**	Internal device error
	Recommended action	Return the positioner to SAMSON AG for repair.
74	**PA parameters**	Parameter errors that are not critical for the control.
	Recommended action	Confirm error and perform reset.
75	**Info parameters**	Info parameter errors that are not critical for the control.
	Recommended action	Confirm error. Check and reset required parameter, if necessary.

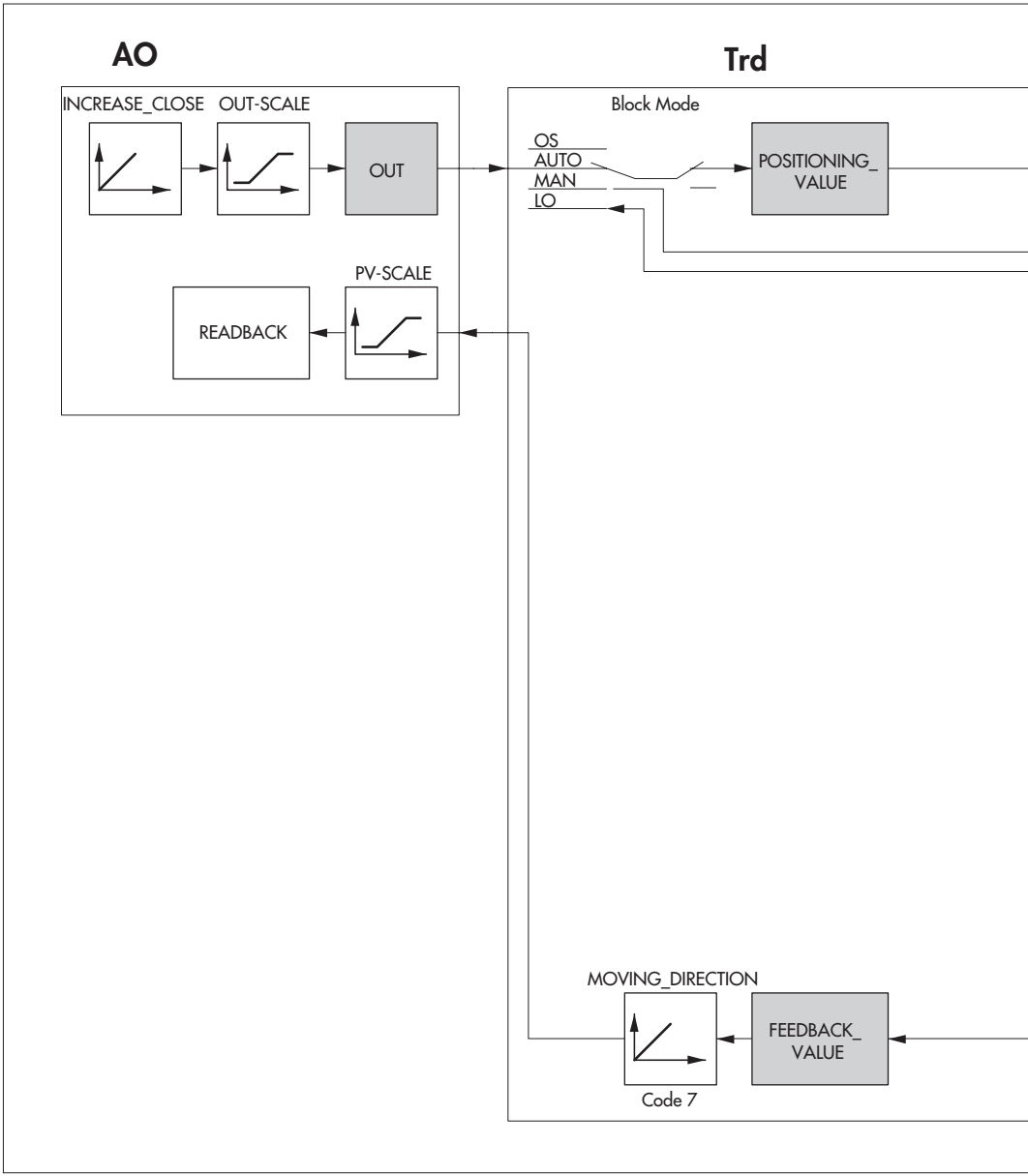
Error codes – Recommended action		Condensed status alarm active, when prompted, ***Err*** appears.
76	**No emergency mode**	The travel measuring system of the positioner has a self-monitoring function (see Code 62). A controlled emergency mode is not available on certain actuators, such as double-acting actuators. For this reason, the positioner moves to the fail-safe position when a measuring error occurs. During the initialization, the positioner checks whether the actuator has such a function or not.
	Recommended action	Merely information, confirm, if necessary. No further action necessary.
77	**Program loading error** Additional alarm at the fault alarm contact	When the device starts operation for the first time after the PA signal has been applied, it carries out a self-test (***tEStinG*** runs across the display). If the device loads a program that does not correspond to that of the positioner, the valve moves to the fail-safe position. It is not possible to make the valve leave this fail-safe position again by operating the positioner.
	Recommended action	Interrupt fieldbus signal and restart positioner. Otherwise, return the positioner to SAMSON AG for repair.
Extended diagnositics		
78	**Options parameter**	Errors in options parameters
79	**Diagnostic alarms**	Alarms are generated in the EXPERT+ extended diagnostics if EXPERT+ has been successfully activated in Code 48.
80	**Diagnostic parameters**	Errors that are not critical for control.
	Recommended action	Confirm error. Check and, if necessary, start new reference run.
81	**Reference graphs**	Error on plotting the reference graphs of drive signal y steady-state or drive signal y hysteresis. • Reference run was interrupted • Reference line y steady-state or y hysteresis was not adopted.

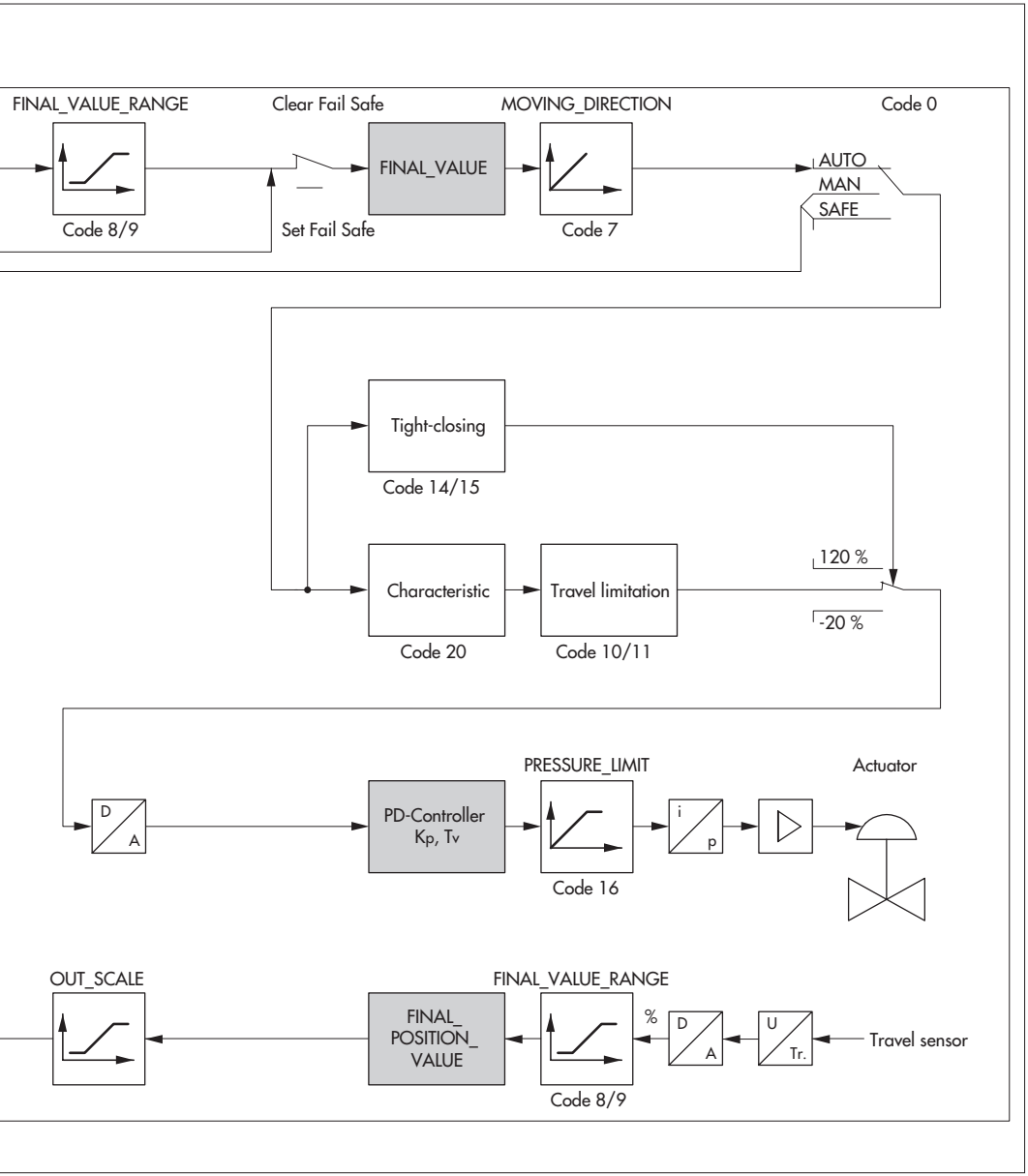
14.2 Parameter lists

Legend

SK (class of memory):	S	Static parameter
	D	Dynamic parameter
	N	Non-volatile parameter
Read/write capability: (access)	r	Read capability
	w	Write capability
Supported modes:	O	O/S (out of service) mode
	M	MAN mode
	A	AUTO mode
	NA	Not analyzed
	CAS	Cascade mode
	RCAS	Remote cascade mode
	ALL	O/M/A/CAS/RCAS

Note: *Parameter marked with an asterisk (*) are included in the cyclic data exchange. All other parameters are included in the acyclic data exchange.*


AO
Trd
INCREASE_CLOSE
OUT-SCALE
OUT
Block Mode
OS
AUTO
MAN
LO
POSITIONING_
VALUE
PV-SCALE
READBACK
MOVING_DIRECTION
FEEDBACK_
VALUE
Code 7


FINAL_VALUE_RANGE
Code 8/9
Clear Fail Safe
Set Fail Safe
FINAL_VALUE
MOVING_DIRECTION
Code 7
Code 0
AUTO
MAN
SAFE
Tight-closing
Code 14/15
Characteristic
Code 20
Travel limitation
Code 10/11
120 %
-20 %
D
A
PD-Controller
Kp, Tv
PRESSURE_LIMIT
Code 16
i
p
Actuator
OUT_SCALE
FINAL_
POSITION_
VALUE
FINAL_VALUE_RANGE
Code 8/9
%
D
A
U
Tr.
Travel sensor

Physical Block, Slot 0 · Profile-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [default value]
ALARM_SUM	**23**		r		[0]
ALERT_KEY	**20**	S	r/w	ALL	[0]
BLOCK_OBJECT	**16**		r		
COND_STATUS_DIAG	**43**	S	r/w	ALL	
DESCRIPTOR	**36**	S	r/w	ALL	
DEVICE_CERTIFICATION	**33**		r		
DEVICE_ID	**27**		r		
DEVICE_INSTAL_DATE	**38**	S	r/w	ALL	
DEVICE_MAN_ID	**26**		r		
DEVICE_MESSAGE	**37**	S	r/w	ALL	
DEVICE_SER_NUM	**28**		r		
DIAG_EVENT_SWITCH	**44**	S	r/w	ALL	
DIAGNOSIS	**29**		r		Bit: 0 = false · 1 = true Byte Bit According to PA V3.01 0 0 DIA_HW_ELECTR 0 1 DIA_HW_MECH 0 2 – 0 3 DIA_TEMP_ELECTR 0 4 DIA_MEM_CHKSUM 0 5 DIA_MEASUREMENT 0 6 DIA_NOT_INIT 0 7 DIA_INIT_ERR 1 0 DIA_ZERO_ERR 1 1 – 1 2 DIA_CONF_INVAL 1 3 DIA_WARMSTART 1 4 DIA_COLDSTART 1 5 DIA_MAINTAINANCE 1 6 DIA_CHARACT 1 7 IDENT_NUMBER_VIOLATION

Continued: next page

Description
Indicates current state of process alarms in the Physical Block.
Contains the ID number of the plant unit.
Used to select whether the positioner is used according to Profile 3.01 or used with condensed states. A change is not permissible in the DATA_EXCHANGE (cyclic) state.
User-definable text to describe the device within the application, which is saved in the field device.
Contains a list of notified bodies that have issued explosion protection certificates for this field device.
Contains manufacturer-specific identification of the field device.
Contains date of installation of the field device.
Contains the identification code of the manufacturer of the field device.
User-definable text saved in the field device.
Contains the serial number of the field device and provides clear identification of the device in combination with DEVICE_MAN_ID and DEVICE_ID.
Contains the classification of the diagnostic and status alarms.
Detailed information of the device, bitwise coded. More than one alarm possible at once. Type of alarm: A Dynamic alarm: automatically reset after 10 seconds R Static alarm: remains active as long as the reason for the alarm still exists in the device

Type of alarm	Description
. . . R	Hardware error in the electronics
. . . R	Hardware error in the mechanics
. . . R	Temperature in the electronics too high
. . . R	Checksum error in the data memory
. . . R	Error occurred in measurement
. . . R	Device not initialized/Self-calibration has not been performed
. . . R	Initialization incorrect
. . . R	Zero point error (end position)
. . . R	Configuration invalid/invalid address
. . . A	Restart-up (warm start) performed
. . . A	New start-up (cold start) performed
. . . R	Maintenance necessary
. . . R	Invalid characteristic
. . . R	The ID number selected could not yet be implemented by the device

Parameter	Index	SK	Access	Mode	Selection/display [default value]
Continued: DIAGNOSIS	**29**		r		Byte Bit According to PA V3.01 2 0 DIA_MAINTENANCE_ALARM. . . . 2 1 DIA_MAINTENANCE_DEMANDED 2 2 DIA_FUNCTION_CHECK. . . . . . 2 3 DIA_INV_PRO_COND . . . . . . 2 4…7 – 3 0…7 – 4 0…6 – 4 7 EXTENSION_AVAILABLE. . . . .
DIAGNOSIS_EXT	**30**		r		Bit: 0 = false · 1 = true Byte Bit Description 0 0 Device not initialized 0 1 Solenoid valve active 0 2 LV total valve travel (Code 24) 0 3 Control loop error (Code 57) 0 4 Zero point error (Code 58) 0 5 Autocorrection (Code 59) 0 6 Fatal error (Code 60) 0 7 Extended diagnostics available (only with EXPERT+) 1 0 x > permissible range (Code 50) 1 1 Delta x < permissible range (Code 51) 1 2 Attachment (Code 52) 1 3 Init time > (Code 53) 1 4 Init - solenoid valve (Code 54) 1 5 Transit time < (Code 55) 1 6 Pin position (Code 56) 1 7 Test or calibration in progress
DIAGNOSIS_MASK	**31**		r		Bit = 0: Status not available Bit = 1: Status available
DIAGNOSIS_MASK_EXT	**32**		r		Bit = 0: Status not available Bit = 1: Status available

Description

Type of alarm	Description
. . . R	A device error exists
. . . R	Maintenance demanded
. . . R	Device performing a function check or it is in simulation or in MODE_LO
. . . R	The current process conditions do not allow a valid calculation of values.

Further diagnostic information available, refer to DIAGNOSIS_EXT/DIAGNOSIS_EXTENSION_2 parameters

Further detailed information of the device, bitwise coded. More than one alarm possible at once.

Byte	Bit	Description
2	0	x signal (Code 62)
2	1	i/p converter (Code 64)
2	2	Hardware error (Code 65)
2	3	Control parameter error (Code 68)
2	4	Potentiom. parameter error (Code 69)
2	5	Calibration (Code 70)
2	6	No production calibration
2	7	General parameters (Code 71)
3	0	Emergency mode · No error (Code 76)
3	1	Program loading error (Code 77)
3	2	Options parameter (Code 78)
3	3	Info parameter (Code 75)
3	4	Data memory (Code 66)
3	5	Test calculation (Code 67)
3	6	PA parameters (Code 74)
3	7	Diagnostic parameters (Code 80)

Byte	Bit	Description
4	0	Reset: Communication controller
4	1	Reset: Bus link error alarm
4	2	Bin2 deactivated
4	3	Reset: Control controller
4	4	–
4	5	–
4	6	–
4	7	–
5	0	Supply air: Perhaps modified (TEST)
5	1	Supply air: Perhaps insufficient (TEST)
5	2	Supply air: Perhaps insufficient
5	3	Supply air: At full capacity
5	4	Supply air: At full capacity (TEST)
5	5	Supply air: Perhaps modified
5	6	Actuator springs: Spring stiffness reduced (TEST)
5	7	Actuator springs: Pre-tensioning reduced (TEST)

Defines the availability of the status bit in DIAGNOSIS parameter

Defines the availability of the status bit in DIAGNOSIS_EXT parameter

Parameter	Index	SK	Access	Mode	Selection/display [default value]
FACTORY_RESET	**35**	S	r/w	ALL	1 (0x0001) . . . . .
					2506 (0x09CA) . . . . .
					2712 (0x0A98) . . . . .
					32768 (0x8000) . . . . .
					32769 (0x8001) . . . . .
					32770 (0x8002) . . . . .
					Identification parameters . . (without bus address, valve and actuator data)
					Start-up parameters . . . . . Status classification, analysis of condensed status (Code 36)
					Function block parameters .

Description

Command to reset the positioner to default values

Resets the start-up, identification and function block parameters as well as the status classification
Note: *After performing a reset, the positioner needs to be re-initialized!*

Warm start

Resets the bus address to the default value of 126. The positioner restarts after the reset is performed.
Note: *The bus address can only be reset using this command in firmware version K 1.11 and higher. The bus address is not reset when the identification parameters are reset.*

Resets the identification parameters

Resets the start-up and function block parameters as well as the status classification
Note: *After performing a reset, the positioner needs to be re-initialized!*

Resets the start-up parameters
Note: *After performing a reset, the positioner needs to be re-initialized!*

Physical Block: CONFIG_BINARY_INPUT_2[1)], DEVICE_INSTAL_DATE, DEVICE_MESSAGE, DESCRIPTOR, IDENT_LIMIT_SWITCHES[1)], IDENT_NUMBER_SELECTOR, TAG_DESC, TEXT_INPUT 1 to 5[1)]

AO Function Block: TAG_DESC

AO Transducer Block: ACTUATOR_MAN, ACTUATOR_SER_NUM, ADD_GEAR_ID, ADD_GEAR_INST_DATE, ADD_GEAR_MAN, ADD_GEAR_SER_NUM, DEVICE_CALIB_DATE, DEVICE_CHARACT[1)], DEVICE_CONFIG_DATE, TAG_DESC VALVE_MAINT_DATE, VALVE_MAN, VALVE_SER_NUM, VALVE_TYPE

DI1/2 Function Block: TAG_DESC

DI1/2 Transducer Block: SENSOR_ID, SENSOR_MAN, SENSOR_SER_NUM, TAG_DESC

Physical Block: COND_STATUS_DIAG, DIAG_EVENT_SWITCH, DIAG_EVENT_SWITCH_2[1)], FEATURE

Physical Block: ALERT_KEY, FACTORY_RESET, FEATURE_SELECT, LOCAL_OP_ENA, ST_REV, STRATEGY, TARGET_MODE, WRITE_LOCKING

AO Function Block: ALERT_KEY, BATCH, CHECK_BACK_OPT, FSAFE_TIME, FSAFE_TYPE, FSAFE_VALUE, IN_CHANNEL, INCREASE_CLOSE, OUT_CHANNEL, OUT_SCALE, PV_SCALE, SIMULATE, ST_REV, STRATEGY, TARGET_MODE

AO Transducer Block: ACTUATOR_ACTION, ALERT_KEY, CHARACT_TYPE[1)], SELF_CALIB_CMD, SELF_CALIB_STATUS, ST_REV, STRATEGY, TARGET_MODE

DI1/2 Function Block: ALERT_KEY, BATCH, CHANNEL, FSAFE_TYPE, FSAFE_VAL_D, INVERT, SIMULATE, ST_REV, STRATEGY, TARGET_MODE

DI1/2 Transducer Block: ALERT_KEY, SENSOR_WIRE_CHECK, ST_REV, STRATEGY, TARGET_MODE

[1)] Manufacterer-specific parameter

Parameter	Index	SK	Access	Mode	Selection/display [default value]
FEATURE	**42**		r		Supported / Enabled 0 = Not supported / Not enabled 1 = Supported / Enabled Byte Bit Element 0 0 Condensed_Status. . . . . . 0 1 Expanded_Status/Diagnosis . . . . . 0 2…7 Reserved . . . . . . 1…3 0…7 Reserved . . . . .
HARDWARE_REVISION	**25**		r		
HW_WRITE_ PROTECTION	**41**		r		0 = Unprotected 1 = Protected
IDENT_NUMBER_ SELECTOR	**40**	S	r/w	ALL	0 = Profile-specific ID (0x9710) . . . . . . 1 = Manufacturer-specific ID (0x071D) . . . . .
LOCAL_OP_ENA	**39**	S	r/w	ALL	0 = Disabled 1 = Enabled
MODE_BLK	**22**		r		
SOFTWARE_REVISION	**24**		r		
ST_REV	**17**		r		
STRATEGY	**19**	S	r/w	ALL	
TAG_DESC	**18**	S	r/w	ALL	[32 user-definable characters]
TARGET_MODE	**21**	S	r/w	ALL	5 = AUTO (automatic mode) 128 = O/S (out of service mode)
VIEW1	**240**		r		
WRITE_LOCKING	**34**	S	r/w	ALL	0 = Writing access locked 2457 = Writing access permitted

Description

Describes the optional features integrated into the device as well as the existence and state of the features.
Note! The structure for Supported and Enabled are identical!

Default	Description
. . . 1	Status and diagnostics complying with condensed state profile extension
. . . 1	Status and diagnostics according to Profile 3.01
. . . 0	
. . . 0	

Hardware version (electronics/mechanics)

Indicates the position of the write protection switch on the device.

Used to select the ID number
. . . GSD file: PA139710.GSD
. . . GSD file: SAMS071D.GSD

Local operation enabled
If communication fails for a time longer than 30 seconds, local operation will be enabled automatically.

Indicates the actual mode.

Contains the firmware version (communication/control).

Indicates the revision level of static data.

This parameter is used to group blocks for their faster analysis.
Blocks are grouped by entering the same value in the STRATEGY parameter of each block.

Used to enter a user-selected text to identify and assign blocks.

Desired mode of operation

Collective command allowing a group of parameters to be read with one single read-service.

Software write protection

Parameter index

Index	Parameter
16	BLOCK_OBJECT
17	ST_REV
18	TAG_DESC
19	STRATEGY
20	ALERT_KEY

Index	Parameter
21	TARGET_MODE
22	MODE_BLK
23	ALARM_SUM
24	SOFTWARE_REVISION
25	HARDWARE_REVISION

Index	Parameter
26	DEVICE_MAN_ID
27	DEVICE_ID
28	DEVICE_SER_NUM
29	DIAGNOSIS
30	DIAGNOSIS_EXT

Index	Parameter
31	DIAGNOSIS_MASK
32	DIAGNOSIS_MASK_EXT
33	DEVICE_CERTIFICATION
34	WRITE_LOCKING
35	FACTORY_RESET

Index	Parameter
36	DESCRIPTOR
37	DEVICE_MESSAGE
38	DEVICE_INSTAL_DATE
39	LOCAL_OP_ENA
40	IDENT_NUMBER_ SELECTOR

Index	Parameter
41	HW_WRITE_ PROTECTION
42	FEATURE
43	COND_STATUS_DIAG
44	DIAG_EVENT_SWITCH
240	VIEW1

Physical Block, Slot 0 · Manufacturer-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [default value]
CONFIG_BINARY_ INPUT_2	**59**	S	r/w	ALL	0 Floating contact – DI2 . . . . . 1 Actively open – . . . . . Diagnosis leakage sensor – DI2 2 Actively closed – . . . . . Diagnosis leakage sensor – DI2 3 Solenoid valve – CB_FAIL_SAFE/DI2 . . . . . 4 Actively open – Diagnosis leakage sensor /. . . CD_ADD_INPUT / Solenoid valve – DI2 5 Actively closed – Diagnosis leakage sensor /. . CD_ADD_INPUT / Solenoid valve – DI2 6 Actively open – Diagnosis leakage sensor /. . . CD_ADD_INPUT / Solenoid valve – DI2 7 Actively closed – Diagnosis leakage sensor /. . CD_ADD_INPUT / Solenoid valve – DI2
DATALOGGER_DS_1 to DATALOGGER_DS_14	**111 to 124**		r r		Element Parameter name 0 SOLLWERT_W_1 1 ISTWERT_X_1 2 STELLSIGNAL_Y_1 3 REGELABWEICH_E_1 4 ZEIT_T_1 … 30 SOLLWERT_W_7 31 ISTWERT_X_7 32 STELLSIGNAL_Y_7 33 REGELABWEICH_E_7 34 ZEIT_T_7

Description

Configuration of the second binary input

. . . The input is analyzed with the second DI Function Block.

. . . A leakage sensor is operated at the input as actively open. This information is passed on by the extended diagnostics as “External leakage may exist” and can be analyzed with Function Block DI2.

. . . A leakage sensor is operated at the input as actively closed. This information is passed on by the extended diagnostics as “External leakage may exist” and can be analyzed with Function Block DI2.

. . . The internal solenoid valve is used and the information (SV wired same as 1) is analyzed with Function Block DI2. This information is also transmitted cyclically with CHECKBACK (CB_FAIL_SAFE). The input is not switched.

. . . A leakage sensor is operated at the input as actively open. This information is also transmitted cyclically with CHECKBACK (CB_ADD_INPUT). Additionally, the state of the internal solenoid valve is switched to Function Block DI2.

. . . A leakage sensor is operated at the input as actively closed. This information is also transmitted cyclically with CHECKBACK (CB_ADD_INPUT). Additionally, the state of the internal solenoid valve is switched to Function Block DI2.

. . . A leakage sensor is operated at the input as actively open. This information can be analyzed with Function Block DI2. Additionally, the state of the internal solenoid valve is also transmitted cyclically with CHECKBACK (CB_ADD_INPUT).

. . . A leakage sensor is operated at the input as actively closed. This information can be analyzed with Function Block DI2. Additionally, the state of the internal solenoid valve is also transmitted cyclically with CHECKBACK (CB_ADD_INPUT).

Test function AUTO: Data logger – Data set 1
to
Test function AUTO: Data logger – Data set 14

Data sets 1 to 14 consisting of 7 packages (one package consisting of w, x, y, e and t variables)

DATALOGGER_DS_15	**125**		r		Element — Parameter name 0 — SOLLWERT_W_1 1 — ISTWERT_X_1 2 — STELLSIGNAL_Y_1 3 — REGELABWEICH_E_1 4 — ZEIT_T_1 5 — SOLLWERT_W_2 6 — ISTWERT_X_2 7 — STELLSIGNAL_Y_2 8 — REGELABWEICH_E_2 9 — ZEIT_T_2
DEVICE_PRODUCT_NUM	**51**	S	r/w	ALL	
DIAG_EVENT_SWITCH_2	**61**	S	r/w	ALL	
DIAGNOSIS_ EXTENSION_2	**60**		r		Bit: 0 = false · 1 = true Byte Bit — Description **Actuator springs:** 0 0 — Perhaps stiffness increased (TEST) 0 1 — At full capacity 0 2 — At full capacity (TEST) **Shift of working range:** 0 3 — Closed position 0 4 — Max. open **Friction:** 0 5 — Higher over whole range 0 6 — Lower over whole range 0 7 — Higher over partial range 1 0 — Lower over partial range 1 1 — Higher over whole range (TEST) 1 2 — Lower over whole range (TEST) 1 3 — Higher over partial range (TEST) 1 4 — Lower over partial range (TEST) **Leakage in pneumatics:** 1 5 — Perhaps existing (TEST) 1 6 — Perhaps existing 1 7 — Too large (TEST) 2 0 — Perhaps too large
DIAGNOSIS_EXT_1_RAW DIAGNOSIS_EXT_2_RAW	**62** **63**		r r		
DL_TRIGGER_SELECT_BIN	**135**	N	r/w	ALL	0 = Binary input 1 1 = Binary input 2

Test function AUTO: Data logger – data set 15

Data set 15 consisting of 2 packages (one package consisting of w, x, y, e and t variables)

Indicates the product number of the positioner.

Further detailed information of the device, bitwise coded. More than one alarm possible at once.

Byte	Bit	Description
		Restriction of working range:
2	1	Downwards
2	2	Upwards
2	3	Change not possible
2	4	**Dynamic stress factor** > 90 %
		Inner leakage (shut-off):
2	5	Perhaps existing
2	6	Greater than in original state (TEST)
2	7	Greater than in original state
		External leakage:
3	0	Perhaps soon to be expected
3	1	Perhaps existing
3	2	Existing
		Zero point:
3	3	Shift monotonously downwards, average above reference lines
3	4	Shift monotonously upwards, average above reference lines
3	5	Alternating, average above ref. lines
3	6	Shift monotonously downwards, average below reference lines
3	7	Shift monotonously upwards, average below reference lines
4	0	Alternating, average below ref. lines
		Positioner/valve attachment:
4	1	Travel transmission not optimal (TEST)
4	2	Perhaps loose
4	3	Perhaps restricted by working range
4	4	Perhaps loose (TEST)
		Working range:
4	5	Mostly near closing position
4	6	Mostly near max. opening
4	7	Mostly closing position
5	0	Mostly max. opening
5	1	Temperature below –40 °C
5	2	Temperature above 80 °C
5	3	Reference test canceled
5	4	Actuator movement possible
5	5	Actuator movement not possible
5	6	Solenoid valve fault
5	7	–

Diagnostic alarms irrelevant of the selected classification

Binary input options for triggering in the data logger.
Note: This parameter can only be selected in firmware version K 1.11 and higher.

ET_BSZ	**78**		r		Element / Parameter name 0 MESSWERT_0 … 29 MESSWERT_29 30 REFERENZWERT
ET_ENDLAGE	**79**		r		Element / Parameter name 0 MESSWERT_0 … 29 MESSWERT_29 30 REFERENZWERT
ET_VENTILSTELLUNG	**77**		r		Element / Parameter name 0 MESSWERT_0 … 29 MESSWERT_29 30 REFERENZWERT
FEATURE_SELECT	**64**	S	r/w	ALL	Bit: 0 = false · 1 = true Byte / Bit 0 / 0 BAD_DEVICE_FAILURE sets . . . . . DIAG_EXT bit 0 / 1 Test function activated . . . . . . 0 / 2 LO and active diagnostic function. . set GOOD_FUNCTION_CHECK 0 / 3 Use DP standard diagnosis . . . . . (6 bytes)
HISTOGRAMM_E_KURZ	**70**		r		Element / Parameter name 0 E_INTERVAL_VALUE_0 … 11 E_INTERVAL_VALUE_11 12 E_AVERAGE

Statistical information AUTO: Structure for end position trend – operating hours counter

Statistical information AUTO: Structure for end position trend – drive signal

Statistical information AUTO: Structure for end position trend – valve position x

Coded bitwise, therefore several alarms at the same time possible

By selecting "DIA_MAINTENANCE_ALARM sets DIAG_EXT bit", the DIAG.ext bit (Octet 1) is set on using the profile extension "Condensed status and diagnostic messages" when a fault or the corresponding diagnostic alarm DIA_MAINTENANCE_ALARM is detected by the positioner.

Compliance with Profile 3.01 causes the DIAG.ext bit to be set when one of the following errors is detected by the positioner: Test calculation, fatal error, program loading error, no production calibration, hardware, i/p converter

The activation of this function allows errors to be simulated in TROVIS-VIEW (Positioner (AO, TRD) folder (> Simulation) (**Note**: Firmware version K 1.11 and higher)

During a diagnosis test, the Profile indicated that a BAD_FUNCTION_CHECK has been set. This can be prevented by activating this additional function to actually set a BAD_FUNCTION_CHECK. (**Note**: Firmware version K 1.11 and higher)

Select whether the positioner responds to a GET_DIAG telegram with the full diagnosis (14 using as Profile or 26 as manufacturer specification) or only with 6 bytes for DP standard diagnosis (**Note**: Firmware version K 1.11 and higher)

Statistical information AUTO: Structure for short-term histogram plotting e

0 Setpoint deviation interval 0

…

11 Setpoint deviation interval 11

12 Average value e for short-term

HISTOGRAMM_E_LANG	**67**		r		Element / Parameter name 0 E_INTERVAL_VALUE_0 … 11 E_INTERVAL_VALUE_11 12 E_AVERAGE 13 NUMBER_MESS_POINTS 14 DEVIATION_MIN 15 DEVIATION_MAX
HISTOGRAMM_X_KURZ	**69**		r		Element / Parameter name 0 X_INTERVAL_VALUE_0 … 21 X_INTERVAL_VALUE_21 22 X_AVERAGE
HISTOGRAMM_X_LANG	**66**		r		Element / Parameter name 0 X_INTERVAL_VALUE_0 … 21 X_INTERVAL_VALUE_21 22 X_AVERAGE 23 NUMBER_MESS_POINTS
HISTOGRAMM_Z_KURZ	**71**		r		Element / Parameter name 0 Z_INTERVAL_VALUE_0 … 12 Z_INTERVAL_VALUE_12 13 Z_AVERAGE
HISTOGRAMM_Z_LANG	**68**		r		Element / Parameter name 0 Z_INTERVAL_VALUE_0 … 12 Z_INTERVAL_VALUE_12 13 Z_AVERAGE 14 TOTAL_NUMBER 15 DYNAMIC_FACTOR
HYS_STELLSIGNAL	**83**		r		Element / Parameter name 0 REFERENZZEITSTEMPEL 1 TESTINFO 2 FORTSCHRITT 3 REFERENZWERT_VS_0 4 REFERENZWERT_HYST_0 5 WIEDERHOLUNGSWERT_HYST_0 … 36 REFERENZWERT_VS_11 37 REFERENZWERT_HYST_11 38 WIEDERHOLUNGSWERT_HYST_11

Statistical information AUTO: Structure for long-term histogram plotting e

0 Setpoint deviation interval 0
…
11 Setpoint deviation interval 11
12 Average value e for long-term
13 Number of measuring points
14 Min. setpoint deviation
15 Max. setpoint deviation

Statistical information AUTO: Structure for short-term histogram plotting x

0 Valve position interval 1
…
21 Valve position interval 21
22 Average value x for short-term

Statistical information AUTO: Structure for long-term histogram plotting x

0 Valve position interval 0
…
21 Valve position interval 21
22 Average value x for long-term
23 Number of measuring points

Statistical information AUTO: Structure for short-term histogram plotting z

0 Cycle counter interval 0
…
12 Cycle counter interval 12
13 Average value z for short-term

Statistical information AUTO: Structure for long-term histogram plotting z

0 Cycle counter interval 0
…
12 Cycle counter interval 12
13 Average value z for long-term
14 Number of measuring points
15 Dynamic stress factor

Tests MAN: Drive signal diagram hysteresis

HYSTERESE_KURZ	**76**		r		Element Parameter name 0 STELLSIGNAL_0 0 VENTILSTELLUNG_0 … 9 STELLSIGNAL_9 9 VENTILSTELLUNG_9
HYSTERESE_LANG	**75**		r		Element Parameter name 0 MITTELWERT_0 … 18 MITTELWERT_18
IDENT_LIMIT_SWITCHES	**50**	S	r/w	ALL	0 = Not installed 1 = Installed
IDENT_OPTIONS	**49**		r		0 = None of the options installed 1 = Binary input 2 installed 2 = Solenoid valve installed 3 = Inductive limit switch installed 4 to 8 = Options 4 to 8 installed
PRODUCTION_ID	**57**	S	r/w	ALL	
READING_DIRECTION	**58**	S	r/w	ALL	
SPRUNGANTWORT_E_1 to SPRUNGANTWORT_E_4	**103** **to** **106**		r r		
SPRUNGANTWORT_SS_1 SPRUNGANTWORT_SS_2	**101** **102**		r r		
SPRUNGANTWORT_SW_1 to SPRUNGANTWORT_SW_4	**97** **to** **100**		r r		
SPRUNGANTWORT_VS_1 to SPRUNGANTWORT_VS_4	**93** **to** **96**		r r		
SPRUNGANTWORT_ZEIT_1 to SPRUNGANTWORT_ZEIT_4	**107** **to** **110**		r r		
STAT_AGAIN_VS	**81**		r		
STAT_KENNLINIE_R	**84**		r		Element Parameter name
STAT_KENNLINIE_SW_1 to STAT_KENNLINIE_SW_4	**89** **to** **92**		r r		Element Parameter name 0 MESSWERT_0 … 24 MESSWERT_24

Statistical information AUTO: Structure for drive signal diagram hysteresis in short-term monitoring
Statistical information AUTO: Structure for drive signal diagram hysteresis in long-term monitoring
Describes whether the optional inductive limit switch is installed. Not automatically recognized.
Describes whether the optional forced venting and binary input 2 are installed.
The reading on the display is turned by 180°.
Tests MAN: Step response – Setpoint deviation (data set 1) to Tests MAN: Step response – Setpoint deviation (data set 4)
Tests MAN: Step response – Drive signal (data set 1) Tests MAN: Step response – Drive signal (data set 2)
Tests MAN: Step response – Setpoint (data set 1) to Tests MAN: Step response – Setpoint (data set 4)
Tests MAN: Step response – Valve position (data set 1) to Tests MAN: Step response – Valve position (data set 4)
Tests MAN: Step response – Time (data set 1) to Tests MAN: Step response – Time (data set 4)
Tests MAN: Drive signal diagram in steady-state – Repetition value of valve position
Tests MAN: Static characteristic
Tests MAN: Static characteristic – Setpoint (data set 1) to Tests MAN: Static characteristic – Setpoint (data set 4)

STAT_KENNLINIE_VS_1 to STAT_KENNLINIE_VS_4	**85** **to** **88**		r r		
STAT_REF_VS	**80**		r		
STAT_STELLSIGNAL	**82**		r		Element — Parameter name 0 — REFERENZZEITSTEMPEL 1 — TESTINFO 2 — FORTSCHRITT 3 — REFERENZWERT_0 4 — WIEDERHOLUNGSWERT_0 … 51 — REFERENZWERT_24 52 — WIEDERHOLUNGSWERT_24
STATIONAER_KURZ	**73**		r		Element — Parameter name 0 — MITTELWERT_0 … 21 — MITTELWERT_21
STATIONAER_KURZ_RP	**74**		r		Element — Parameter name 0 — STELLSIGNAL_0 0 — VENTILSTELLUNG_0 … 9 — STELLSIGNAL_9 9 — VENTILSTELLUNG_9
STATIONAER_LANG	**72**		r		
TEST_FUNCTION	**65**	N	r/w	ALL	
TEXT_INPUT 1 to TEXT_INPUT 5	**52** **to** **56**	S	r/w r/w	ALL	

Tests MAN: Static characteristic – Valve position (data set 1)
to
Tests MAN: Static characteristic – Valve position (data set 4)

Tests MAN: Drive signal diagram in steady-state – Reference valve position

Tests MAN: Drive signal diagram in steady-state – Drive signal (reference and repetition values)

Statistical information AUTO: Structure for drive signal diagram in steady-state in short-term monitoring

Statistical information AUTO: Structure for drive signal diagram in steady-state in short-term monitoring
Ring buffer values, containing drive signal and valve position

Statistical information AUTO: Structure for drive signal diagram in steady-state in long-term monitoring

For test purposes only – Simulation of all error bits
Function needs to be activated in FEATURE_SELECT parameter.

User-definable text fields

Parameter index

Index	Parameter
49	IDENT_OPTIONS
50	IDENT_LIMIT_SWITCHES
51	DEVICE_PRODUCT_NUM
52	TEXT_INPUT_1
53	TEXT_INPUT_2
54	TEXT_INPUT_3
55	TEXT_INPUT_4
56	TEXT_INPUT_5
57	PRODUCTION_ID
58	READING_DIRECTION
59	CONFIG_BINARY_ INPUT_2
60	DIAGNOSIS_ EXTENSION_2
61	DIAG_EVENT_SWITCH_2
62	DIAGNOSIS_EXT_1_RAW
63	DIAGNOSIS_EXT_2_RAW
64	FEATURE_SELECT
65	TEST_FUNCTION
66	HISTOGRAMM_X_LANG
67	HISTOGRAMM_E_LANG
68	HISTOGRAMM_Z_LANG
69	HISTOGRAMM_X_KURZ
70	HISTOGRAMM_E_KURZ
71	HISTOGRAMM_Z_KURZ
72	STATIONAER_LANG
73	STATIONAER_KURZ
74	STATIONAER_KURZ_RP
75	HYSTERESE_LANG
76	HYSTERESE_KURZ
77	ET_VENTILSTELLUNG
78	ET_BSZ
79	ET_ENDLAGE
80	STAT_REF_VS
81	STAT_AGAIN_VS
82	STAT_STELLSIGNAL
83	HYS_STELLSIGNAL
84	STAT_KENNLINIE_R
85	STAT_KENNLINIE_VS_1
86	STAT_KENNLINIE_VS_2
87	STAT_KENNLINIE_VS_3
88	STAT_KENNLINIE_VS_4
89	STAT_KENNLINIE_SW_1
90	STAT_KENNLINIE_SW_2
91	STAT_KENNLINIE_SW_3
92	STAT_KENNLINIE_SW_4

Index	Parameter
93	SPRUNGANTWORT_VS_1
94	SPRUNGANTWORT_VS_2
95	SPRUNGANTWORT_VS_3
96	SPRUNGANTWORT_VS_4
97	SPRUNGANTWORT_ SW_1
98	SPRUNGANTWORT_ SW_2
99	SPRUNGANTWORT_ SW_3
100	SPRUNGANTWORT_ SW_4
101	SPRUNGANTWORT_SS_1
102	SPRUNGANTWORT_SS_2
103	SPRUNGANTWORT_E_1
104	SPRUNGANTWORT_E_2
105	SPRUNGANTWORT_E_3

Index	Parameter
106	SPRUNGANTWORT_E_4
107	SPRUNGANTWORT_ ZEIT_1
108	SPRUNGANTWORT_ ZEIT_2
109	SPRUNGANTWORT_ ZEIT_3
110	SPRUNGANTWORT_ ZEIT_4
111	DATALOGGER_DS_1
112	DATALOGGER_DS_2
113	DATALOGGER_DS_3
114	DATALOGGER_DS_4
115	DATALOGGER_DS_5
116	DATALOGGER_DS_6
117	DATALOGGER_DS_7
118	DATALOGGER_DS_8

Index	Parameter
119	DATALOGGER_DS_9
120	DATALOGGER_DS_10
121	DATALOGGER_DS_11
122	DATALOGGER_DS_12
123	DATALOGGER_DS_13
124	DATALOGGER_DS_14
125	DATALOGGER_DS_15
135	DL_TRIGGER_SELECT_ BIN

AO Function Block, Slot 1 · Profile-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [default value]
ALARM_SUM	**23**		r		
ALERT_KEY	**20**	S	r/w	ALL	
BATCH	**24**	S	r/w	ALL	
BLOCK_OBJECT	**16**		r		
CHECK_BACK *	**37**		r		
CHECK_BACK_MASK	**38**		r		Bit = 0: Status not supported Bit = 1: Status supported
FSAFE_TIME	**31**	S	r/w	ALL	
FSAFE_TYPE	**32**	S	r/w	ALL	0. . . . . . 1. . . . . . 2. . . . .
FSAFE_VALUE	**33**	S	r/w	ALL	
IN_CHANNEL	**29**	S	r/w	ALL	0. . . . . . 0x013A. . . . .
INCREASE_CLOSE	**40**	S	r/w	ALL	0 = Increasing/Increasing 1 = Increasing/Decreasing
MODE_BLK	**22**		r		
OUT	**41**	S	r/w	ALL	
OUT_CHANNEL	**30**	S	r/w	ALL	0. . . . . . 0x0139 . . . . .
OUT_SCALE	**42**	S	r/w	ALL	

Description
Indicates the current states of the process alarms in the AO Function Block.
Contains the ID number of the plant unit.
Contains the identification of the batch process.
Detailed information of the device, coded bitwise, refer to section 12.3
Defines the supported status bits in CHECK_BACK.
Time in seconds taken until a communication failure is detected. The fail-safe condition is met if no valid communication is detected within the time entered in FSAFE_TIME.
Defines the reaction to be taken when a communication failure or start-up is detected. . . . The default value FSAFE_VALUE is used . . . The last valid setpoint is used/The last valid setpoint is saved . . . Actuator moves to the fail-safe position defined by the actuator springs
Default value for setpoint (reference variable w) used when a communication failure or start-up is detected.
The assignment between the Transducer Block and the Function Block . . . Not active . . . Active (FEEDBACK_VALUE is written to READBACK)
Determines the direction of action, i.e. how the reference variable is assigned to the controlled variable.
Mode of operation of the positioner
Positioning value This positioning value is calculated by the Function Block from the SETPOINT for the Transducer Block in [mm], [degrees] or [%]
The assignment between the Transducer Block and the Function Block . . . Not active . . . Active (OUT is written to POSITIONING_VALUE)
Travel range or rotational angle range Top and bottom values of the actual working range in [mm] or [degrees]. A non-linear characteristic is adapted to the reduced travel. Maximum value for the top value = Rated travel

Parameter	Index	SK	Access	Mode	Selection/display [default value]
POS_D *	**35**		r		0. . Not initialized 1. . Closed (x < 0.5 %) 2. . Opened (x > 99.5 %) 3. . Intermediate position
PV_SCALE	**26**	S	r/w	ALL	
RCAS_IN *	**28**	S	r/w	ALL	Range defined in PV_SCALE
RCAS_OUT *	**34**		r		Range defined in PV_SCALE
READBACK *	**27**		r		Range defined in PV_SCALE
SETP_DEVIATION	**36**		r		
SIMULATE	**39**	S	r/w	ALL	
SP *	**25**	S	r/w	ALL	Range defined in PV_SCALE
ST_REV	**17**		r		
STRATEGY	**19**	S	r/w	ALL	
TAG_DESC	**18**	S	r/w	ALL	[32 user-definable characters]
TARGET_MODE	**21**	S	r/w	ALL	8 = AUTO (automatic) 16 = MAN (manual) 128 = O/S (out of service)
VIEW1	**240**		r		

Description
Current position of the valve (discrete)
Range of the reference variable
Setpoint with status: Reference variable w in RCAS mode Provided by a supervisory host, e.g. PID Block or Master Class1. Depending on mode of the Function Block.
Setpoint with status: Reference variable w in RCAS mode Provided to a supervisory host, e.g. PID Block or Master Class1. Depending on mode of the Function Block.
Current position with status: Controlled variable x in relation to travel range/angle of rotation (OUT_SCALE)
Setpoint deviation [%]
Simulation Simulation of a value/status for READBACK
Setpoint with status: Setting of the valve position between open and closed. Reference variable w in AUTO mode
Indicates the revision level of static data.
This parameter is used to group blocks for their faster analysis. Blocks are grouped by entering the same value in the STRATEGY parameter of each block.
Used to enter a user-selected text to identify and assign blocks.
Desired mode of operation of the positioner
Collective command allowing a group of parameters to be read with one single read-service.

Parameter index

Index	Parameter
16	BLOCK_OBJECT
17	ST_REV
18	TAG_DESC
19	STRATEGY
20	ALERT_KEY

Index	Parameter
21	TARGET_MODE
22	MODE_BLK
23	ALARM_SUM
24	BATCH
25	SP

Index	Parameter
26	PV_SCALE
27	READBACK
28	RCAS_IN
29	IN_CHANNEL
30	OUT_CHANNEL

AO Function Block, Slot 1 · Manufacturer-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [default value]
CHECK_BACK_OPT	**65**	S	r/w	ALL*	[0x8F, 0xEC, 0x83] Bit = 0: Status not supported Bit = 1: Status supported

Index	Parameter
31	FSAFE_TIME
32	FSAFE_TYPE
33	FSAFE_VALUE
34	RCAS_OUT
35	POS_D

Index	Parameter
36	SETP_DEVIATION
37	CHECK_BACK
38	CHECK_BACK_MASK
39	SIMULATE
40	INCREASE_CLOSE

Index	Parameter
41	OUT
42	OUT_SCALE
240	VIEW1

Description

Defines the support of the status bit in CHECK_BACK for cyclic data exchange.

* This alarm does not apply for an acyclic access.

AO Transducer Block, Slot 1 · Profile-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [default value]
ACT_STROKE_TIME_DEC	**89**		r		[1.0 s]
ACT_STROKE_TIME_INC	**90**		r		[1.0 s]
ACTUATOR_ACTION	**143**	S	r/w	ALL	0 = Not initialized 1 = Opening (towards 100 % position) 2 = Closing (towards 0 % position) 3 = None/saving (position remains kept)
ACTUATOR_MAN	**140**	S	r/w	ALL	
ACTUATOR_SER_NUM	**145**	S	r/w	ALL	
ACTUATOR_TYPE	**142**		r		0 = Electropneumatic 1 = Electric 2 = Electrohydraulic 3 = Other
ADD_GEAR_ID	**148**	S	r/w	ALL	
ADD_GEAR_INST_DATE	**149**	S	r/w	ALL	
ADD_GEAR_MAN	**147**	S	r/w	ALL	
ADD_GEAR_SER_NUM	**146**	S	r/w	ALL	
ALARM_SUM	**87**		r		[0]
ALERT_KEY	**84**	S	r/w	ALL	[0]
BLOCK_OBJECT	**80**		r		
DEVICE_CALIB_DATE	**103**	S	r/w	ALL	[XX.XX.20XX]
DEVICE_CONFIG_DATE	**104**	S	r/w	ALL	[XX.XX.20XX]
FEEDBACK_VALUE	**138**		r		Unit of the OUT_SCALE

Description
Specifies the minimum transit time to reach CLOSED position [s] (Code 41) The minimum transit time to reach CLOSED (0 % position) position is the actual time in seconds that the system (consisting of positioner, actuator and valve) needs to move through the rated travel range/angle of rotation to close the valve (measured during initialization).
Specifies the minimum transit time to reach OPEN position [s] (Code 40) The minimum transit time to reach OPEN (100 % position) position is the actual time in seconds that the system (consisting of positioner, actuator and valve) needs to move through the rated travel range/angle of rotation to open the valve (measured during initialization).
Sets the fail-safe action to be performed by the actuator in case of a supply air failure, determined automatically during initialization.
Actuator manufacturer
Specifies the serial number of the actuator used with the positioner.
Type of actuator
Manufacturer ID of any additional components
Date of installation of any additional components
Manufacturer of any additional components
Serial number of any additional components
Indicates current state of process alarms in the AO Transducer Block.
Contains the ID number of the plant unit.
Indicates the date of the last calibration of the field device.
Indicates the date of the last configuration of the field device.
Indicates the current valve position.

Parameter	Index	SK	Access	Mode	Selection/display [default value]
LIN_TYPE	**105**	S	r/w	ALL	0 = Linear 1 = Equal percentage 2 = Equal percentage reverse 3 = User defined (currently not supported) 4 = SAMSON control butterfly valve linear 5 = SAMSON control butterfly valve eq. percent. 6 = Vetec rotary plug valve linear 7 = Vetec rotary plug valve eq. percent.
MODE_BLK	**86**		r		
POSITIONING_VALUE	**137**		r		Unit of the OUT_SCALE
RATED_TRAVEL	**112**	S	r/w	ALL	[15.0 mm]
SELF_CALIB_CMD	**113**	S	r/w	ALL	0 = No test, normal operation 1 = - 2 = Start initialization 3 = Cancel initialization 4 = Start zero point calibration 5 = Cancel zero point calibration 6 = Search for device: “HERE I AM“ on display 7 = Reset “Total valve travel exceeded” 8 to 22 = No function 23 = Reset “Control loop“ 24 = Reset “Zero point“ 25 = Reset “Autocorrection“ 26 = Reset “Fatal error“ 27 = No function 28 = Reset “x > range“ 29 = Reset “Delta x < range“ 30 = Reset “Attachment“

Description

Type of characteristic (Code 20)

Mode of operation of the positioner

Indicates the current positioning value.

Specifies the rated travel [mm] or rotational angle [degrees] of the valve.

Command to start the manufacturer-specific calibration routine in the field device.

31 = Reset "Initialization time exceeded"
32 = Reset "Initialization/solenoid valve"
33 = Reset "Travel time too short"
34 = Reset "Pin position"
35 to 39 = No function
40 = Reset "x signal"
41 = Reset "i/p converter"
42 = Reset "Hardware"
43 = Reset "Control parameter"
44 = Reset "Poti parameter"
45 = Reset "Calibration"
46 = Reset "General parameters"
47 = Reset "Internal device error 1"
48 = Reset "No emergency mode"
49 = Reset "Program loading error"
50 = Reset "Option parameter"
51 = Reset "Info parameter"
52 = Reset "Data memory"
53 = Reset "Test calculation"
54 = No function
55 = Reset "Diagnostic parameter"
56 to 59 = No function
60 = Reset "Counter Reset device start up"
61 = Reset "Communication controller"
62 = Reset "Counter Reset communication controller"
–> SW_W_DOG triggered
63 = Reset "Control parameter"
64 = Reset "Counter Reset control loop controller"
65 = Reset "Alarm bus link"
66 = Reset "Counter Reset bus link"

Parameter	Index	SK	Access	Mode	Selection/display [default value]
SELF_CALIB_STATUS	**114**		r		[0] 0 = Undetermined 1 = In progress 2 = Canceled 3 = Range incorrect 4 = Error in mechanics/pneumatics 5 = Gain error 6 = Offset error 7 = Calibration sequence mixed up
SERVO_GAIN_1	**115**	S	r/w	ALL	[7]
SERVO_RATE_1	**116**	S	r/w	ALL	[2]
SETP_CUTOFF_DEC	**118**	S	r/w	ALL	[0.0 %]
SETP_CUTOFF_INC	**119**	S	r/w	ALL	[125.0 %]
ST_REV	**81**		r		[0]
STRATEGY	**83**	S	r/w	ALL	[0]
TAG_DESC	**82**	S	r/w	ALL	[32 characters]
TARGET_MODE	**85**	S	r/w	ALL	[8] = AUTO (automatic) 16 = MAN (manual) 128 = O/S (out of service)
TOT_VALVE_TRAV_LIM	**126**	S	r/w	ALL	[1000000.0]
TOTAL_VALVE_TRAVEL	**125**		r		[0.0]
TRAVEL_LIMIT_LOW	**127**	S	r/w	ALL	[0.0 %]
TRAVEL_LIMIT_UP	**128**	S	r/w	ALL	[100.0 %]

Description

Manufacturer-specific status of the sequence started with SELF_CALIB_CMD parameter

Note: During the zero point key test, this parameter gets the switching state of the zero point key.

11 = Time out
12 = Proportional range restricted too much
13 = Rated travel or transmission incorrectly selected
14 = Mechanics system stuck (during initialization)
15 = Pneumatics system leaks (during initialization)
16 = Action interrupted as a production test has not yet been performed successfully
17 = Initialization status: Mechanical stops determined
18 = Initialization status: Minimum control pulse determined
19 = Initialization status: Minimum transit times determined
20 = Initialization canceled by activation of forced venting
30 = Zero point error
254 = Successful
255 = No valid data from the application

K_P step (Code 17)

T_V step (Code 18)

Final position w < (Code 14)

If the reference variable exceeds the entered value, the valve moves towards the final position which corresponds to 0 % reference variable.
Electropneumatic actuators are completely filled with air or vented (depending on the fail-safe position).

Final position w > (Code 15)

If the reference variable exceeds the entered value, the valve moves towards the final position which corresponds to 100 % reference variable.
Electropneumatic actuators are completely filled with air or vented (depending on the fail-safe position).

Indicates the revision level of static data.

This parameter is used to group blocks for their faster analysis.

Blocks are grouped by entering the same value in the STRATEGY parameter of each block.

Used to enter a user-selected text to identify and assign blocks.

Desired mode of operation

Limit value for the total valve travel (Code 24)

Totaled double valve travel (Code 23)

Limitation of the travel/angle of rotation [% of working range PV_SCALE] (Code 10) downwards to the entered value; The characteristic is not adapted.

Limitation of the travel/angle of rotation [% of working range PV_SCALE] (Code 11) upwards to the entered value; The characteristic is not adapted.

Parameter	Index	SK	Access	Mode	Selection/display [default value]
TRAVEL_RATE_DEC	**129**	S	r/w	ALL	[0.0 s]
TRAVEL_RATE_INC	**130**	S	r/w	ALL	[0.0 s]
VALVE_MAINT_DATE	**131**	S	r/w	ALL	[XX.XX.20XX]
VALVE_MAN	**139**	S	r/w	ALL	
VALVE_SER_NUM	**144**	S	r/w	ALL	
VALVE_TYPE	**141**	S	r/w	ALL	0. . . . . . 1. . . . . . 2 . . . . .
VIEW1	**241**		r		

Parameter index

Index	Parameter
80	BLOCK_OBJECT
81	ST_REV
82	TAG_DESC
83	STRATEGY
84	ALERT_KEY
85	TARGET_MODE
86	MODE_BLK

Index	Parameter
87	ALARM_SUM
89	ACT_STROKE_TIME_DEC
90	ACT_STROKE_TIME_INC
103	DEVICE_CALIB_DATE
104	DEVICE_CONFIG_DATE
105	LIN_TYPE
112	RATED_TRAVEL

Index	Parameter
113	SELF_CALIB_CMD
114	SELF_CALIB_STATUS
115	SERVO_GAIN_1
116	SERVO_RATE_1
118	SETP_CUTOFF_DEC
119	SETP_CUTOFF_INC
125	TOTAL_VALVE_TRAVEL

Description
Required transit time CLOSED [s] Minimum time required to move through the working range to 0 % position
Required transit time OPEN [s] Minimum time required to move through the working range to 100 % position
Date of the last maintenance performed on the field device
Valve manufacturer
Serial number of the valve that the positioner is mounted on
Type of valve . . . Valve with straight-moving plug . . . Valve with rotary moving plug (part-turn) . . . Valve with rotary moving plug (multi-turn)
Collective command allowing a group of parameters to be read with one single read-service.

Index	Parameter
126	TOT_VALVE_TRAV_LIM
127	TRAVEL_LIMIT_LOW
128	TRAVEL_LIMIT_UP
129	TRAVEL_RATE_DEC
130	TRAVEL_RATE_INC
131	VALVE_MAINT_DATE
137	POSITIONING_VALUE

Index	Parameter
138	FEEDBACK_VALUE
139	VALVE_MAN
140	ACTUATOR_MAN
141	VALVE_TYPE
142	ACTUATOR_TYPE
143	ACTUATOR_ACTION
144	VALVE_SER_NUM

Index	Parameter
145	ACTUATOR_SER_NUM
146	ADD_GEAR_SER_NUM
147	ADD_GEAR_MAN
148	ADD_GEAR_ID
149	ADD_GEAR_INST_DATE
241	VIEW1

AO Transducer Block, Slot 1 · Manufacturer-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [default value]
AUTOSTART_HYST	**194**	S	r/w	ALL	
BLOCKING_POSITION	**166**	S	r/w	ALL	
CHARACT_TYPE	**173**	S	r/w	ALL	
CLOSING_DIRECTION	**165**	S	r/w	ALL	
COUNTER_INIT_START	**198**		r		
DATALOGGER	**185**		r		Element / Parameter name 0 DATALOGGER_SELECT 1 TRIGGER_SELECT 2 SAMPLE_RATE 3 START_VALUE 4 LOGGING_LIMIT 5 PRETRIGGER_TIME
DATALOGGER_READ	**186**		r		Element / Parameter name 0 TESTINFO 1 MAX_PRETRIGGERZEIT 2 FORTSCHRITT 3 ZÄHLER_TAGE 4 ZÄHLER_STUNDEN 5 ZÄHLER_MINUTEN 6 ZÄHLER_SEKUNDEN 7 ZÄHLER_100msTAKT
DELAY_TIME	**181**	S	r/w	ALL	[30]

Description
Indicates the minimum interval to perform the hysteresis test (EXPERT+).
Indicates and modifies the blocking position.
Type of characteristic. Text field (32 characters) to describe the characteristic used
Indicates and modifies the closing direction.
Specifies the number of initialization cycles that have been performed since the last reset.
Structure of read and write parameters of the data logger (EXPERT+)
Structure of read parameters of the data logger (EXPERT+) 0. . Test information 1. . Max. pretrigger time 2. . Progress 3. . Day counter 4. . Hour counter 5. . Minute counter 6. . Second counter 7. . 100 ms tact counter
Specifies the delay time (reset criterion when closed-loop operation monitoring is in progress). If the entered DELAY_TIME is exceeded and the system deviation is outside the specified TOLERANCE_BAND, a control loop error is indicated. Determined from the minimum transit time during initialization.

Parameter	Index	SK	Access	Mode	Selection/display [default value]
DEVICE_CHARACT	**202**	S	r/w	ALL	Element — Parameter name 0 — ACTUATOR_SIZE 1 — ACTUATOR_VERSION 2 — ATTACHMENT 3 — PRESSURE_RANGE_START 4 — PRESSURE_RANGE_END 5 — SUPPLY_PRESSURE 6 — BOOSTER 7 — STUFFING_BOX 8 — SEALING_EDGE 9 — PRESSURE_BALANCING 10 — FLOW_CHARACTERISTC 11 — FLOW_DIRECTION 12 — NOM_DIAMETER 13 — NOM_DIAMETER_DN 14 — KVS_UNIT 15 — KVS_VALUE 16 — SEAT_DIAM_VALVE
DEVICE_INIT_STATE	**163**		r		
DIAG_TESTINFO	**201**		r		0 = No active test 1 = d1 Drive signal diagram steady-state 2 = d2 Drive signal diagram hysteresis 4 = d3 Static characteristic
DIAGNOSE_LEVEL	**195**		r		EXPERT . . . Standard diagnostics EXPERT+. . . Extended diagnostics ESD. . . . . Emergency Shutdown
ELAPSED_HOURS_METERS	**193**		r		Element — Parameter name 0 — ELAPSED_HOURS_METER 1 — DEVICE_IN_CLOSED_LOOP 2 — POWER_ON_SINCE_INIT 3 — DEVICE_IN_CLOSED_LOOP_SINCE_LAST_INIT

Description

Structure of the device properties

0 Actuator effective area
1 Type of actuator
2 Attachment
3 Lower signal pressure range value
4 Upper signal pressure range value
5 Supply pressure
6 Booster
7 Stem packing
8 Plug/seat facing (leakage class)
9 Pressure balancing
10 Flow characteristic
11 Direction of flow
12 Nominal size standard
13 Nominal size DN
14 K_{VS} unit
15 K_{VS} coefficient
16 Seat diameter of the valve

Indicates whether the device has been initialized.

Info parameter concerning an active diagnostic test running (EXPERT+)

8 = d4 Step response test
16 = d5 Hysteresis online test – activated
32 = d5 Hysteresis online test – running
64 = Permanent data logging
128 = Triggered data logging
256 = Reference test
516 = All tests started automatically in sequence

Indicates the diagnostic level.

Operating hours counter

0. . Operating hours: Device switched on
1. . Operating hours: Device in closed-loop operation
2. . Operating hours: Device switched on since the last initialization
3. . Operating hours: Device in closed-loop operation since the last initialization

Parameter	Index	SK	Access	Mode	Selection/display [default value]
ENHANCED_DIAG_CMD	**192**	S	r/w	ALL	0 = No function 1 = Start data logging 2 = Stop data logging 3 = Start hysteresis online test 4 = Stop hysteresis online test 5 = Start step response test 6 = Stop step response test 7 = Start all tests automatically in sequence 8 = Stop tests 9 = Start drive signal test in steady-state 10 = Stop drive signal test in steady-state 11 = Start drive signal test in hysteresis 12 = Stop drive signal test in hysteresis 13 = Start static characteristic test 14 = Stop static characteristic test 15 = Start reference test 16 = Stop reference test
EVENT_LOGGING_1 EVENT_LOGGING_2	**190** **191**		r r		Element — Parameter name 0 — MESSAGES_0…15 1 — ELAPSED_HOURS_METER_0…15 … 29 — MESSAGE_14…29 30 — ELAPSED_HOURS_METER_14…29
FINAL_POSITION_VALUE	**183**		r		
FINAL_VALUE	**184**	S	r/w	ALL	
FINAL_VALUE_RANGE	**179**	S	r/w	ALL	[0.0 to 100.0] EU_100 (Code 9) EU_0 (Code 8) UNITS_INDEX DECIMAL
HISTOGRAMM_E_ ABTASTRATE	**200**	S	r/w	ALL	
HISTOGRAMM_X_ ABTASTRATE	**199**	S	r/w	ALL	

Description

Extended diagnostic tests

17 = Reset "Data logging"
18 = Reset all diagnostic information
19 = Reset "Operating hours counter"
20 = Reset temperature information
21 = Reset "Travel histogram – long-term monitoring"
22 = Reset "Cycle counter histogram – long-term monitoring"
23 = Reset "Setpoint deviation histogram – long-term monitoring"
24 = Reset "y - x – long-term monitoring"
25 = Reset "y - x – short-term monitoring"
26 = Reset "Drive signal diagram – hysteresis – long-term monitoring"
27 = Reset "End position trend"
28 = Reset "End position – reference values"
29 = Reset "Travel histogram – short-term monitoring"
30 = Reset "Setpoint deviation histogram – short-term monitoring"
31 = Reset "Cycle counter histogram – short-term monitoring"
32 = Reset "Drive signal diagram – hysteresis – short-term monitoring"
33 = Reset "y - x – reference values"
34 = Reset "Reference measurement - hysteresis"
35 = Reset "Data logger"
36 = Reset "Static characteristic"
37 = Reset "Step response"
38 = Reset "y - x – measured data"
39 = Reset "Drive signal diagram – hysteresis - measured data"

Data sets 1/2 of the event logging (EXPERT+)

0 Alarm recording 0…15
1 Time stamp of recorded alarms 1…15
…
29 Alarm recording 14…29
30 Time stamp of recorded alarms 14…29

Specifies the current valve position in % in relation to the operating range FINAL_VALUE_RANGE.

Contains the output value received from the upstream Analog Output Function Block.

This parameter sets the travel range/angle of rotation. The set point FINAL_VALUE is sent to the Analog Output Transducer Block directly from an upstream AO Function Block.

Scan rate for setpoint deviation histogram for short-term monitoring (EXPERT+)

Scan rate for travel histogram for short-term monitoring (EXPERT+)

Parameter	Index	SK	Access	Mode	Selection/display [default value]
INIT_METHOD	**161**	S	r/w	ALL	0 = Maximum range 1 = Nominal range 2 = Manual adjustment 3 = Substitute 4 = Zero point
MOVING_DIRECTION	**164**	S	r/w	ALL	
NO_OF_ZERO_ POINT_ADJ	**196**		r		
PIN_POSITION	**160**	S	r/w	ALL	
PRESSURE_LIMIT	**177**	S	r/w	ALL	1 = Off 2 = 3.7 bar 3 = 2.4 bar 4 = 1.4 bar
SELF_CALIB_WARNING	**167**		r		[0]
SET_FAIL_SAFE_POS	**178**	S	r/w	ALL	0 = Not active 1 = Set fail-safe position 2 = Clear fail-safe position
SETP_CUTOFF_DEC_ON	**171**	S	r/w	ALL	
SETP_CUTOFF_INC_ON	**170**	S	r/w	ALL	
SIGNAL_PRESSURE_ ACTION	**176**	S	r/w	ALL	
STAT_KENNLINIE_RW	**204**	S	r/w	ALL	Element — Parameter name 0 — START 1 — ENDE 2 — WARTEZEIT_NACH_SPRUNG 3 — ANZAHL_BIS_UMKEHR
STATUS_SOLENOID_ VALVE	**182**		r		

Description
Used to select the type of initilization
Direction of operation, i.e. how the reference variable w is assigned to the controlled variable x
Indicates the number of zero point calibrations since the last initialization.
This pin position needs to be entered for initialization in NOM or SUb operating modes. The follower pin must be place in the correct pin position depending on the valve travel/rotational angle. Refer to Table Code 4, on page 111.
Used to enter the pressure limit (Code 16).
Information on any initialization errors
Allows the valve to be moved to its actual fail-safe position over the bus. The positioner remains, however, still in AUTO mode. Fail-safe position is indicated by an S blinking on the display. **Note:** An S blinking on the display also indicates an invalid setpoint (bad status).
Activate/deactivate the final position when w falls belows the adjusted valve.
Activate/deactivate the final position when w exceeds the adjusted valve.
This parameter is determined during initialization and indicates the position of the slide switch (AIR TO OPEN/CLOSE). The positioner needs to be re-initialized when the switch position is changed.
Contains parameters for static characteristic test (d3) which can be read and written. 0. . Start 1. . End 2. . Waiting time after step 3. . Number of measurements until return
Indicates the status of the solenoid valve (Code 45).

Parameter	Index	SK	Access	Mode	Selection/display [default value]
STEP_RESPONSE_R	**188**		r		Element / Parameter name 0 OVERSHOOT_RISING 1 OVERSHOOT_FALLING 2 DEAD_TIME_RISING 3 DEAD_TIME_FALLING 4 TIME_63_RISING 5 TIME_63_FALLING 6 TIME_98_RISING 7 TIME_98_FALLING 8 STEP_PROGRESS 9 RISE_TIME_FALLING 10 SETTLING_TIME_FALLING 11 RISE_TIME_RISING 12 SETTLING_TIME_RISING 13 DURATION_OF_TEST 14 TESTINFO
STEP_RESPONSE_RW	**189**	S	r/w	ALL	Element / Parameter name 0 STEPSTART 1 STEPEND 2 STEP_SAMPLE_RATE 3 RAMPE_UP 5 RAMPE_DOWN 6 LATENCY_AFTER_STEP 7 STEP_SELECTION
SUB_MODE_INIT	**162**		r		
TEMP_MONITORING	**187**		r		Element / Parameter name 0 CURRENT_TEMP 1 MAX_TEMP 2 TIME_MAX_TEMP 3 MIN_TEMP 4 TIME_MIN_TEMP 5 PERIOD_TIME_HIGH 6 PERIOD_TIME_LOW
TOLERANCE_BAND	**180**	S	r/w	ALL	0.1 to 10 %

Description

Structure of reading parameters for step response test (EXPERT+)

Structure of reading and writing parameters for the step response test (EXPERT+)

0 Step start
1 Step end
2 Scan rate
3 Ramp time rising
5 Ramp time falling
6 Delay time after step
7 Number of steps

Indicates whether an initialization has been performed in SUb mode.

Structure containing parameters concerning the temperature.

0 Current temperature
1 Maximum temperature
2 Maximum temperature (point in time)
3 Minimum temperature
4 Minimum temperature (point in time)
5 Period of duration (max. temperature)
6 Period of duration (min. temperature)

(Code 19)

Parameter	Index	SK	Access	Mode	Selection/display [default value]
TRANSDUCER_STATE	**172**		r		[0] = See operating mode 1 = Solenoid valve active 2 = Lower travel limit active (Code 10) 3 = Upper travel limit active (Code 11) 4 = End position < active (Code 14) 5 = End position > active (Code 15) 7 = Fail-safe position active 255 = Normal operation
TRAVEL_LIMIT_LOW_ON	**168**	S	r/w	ALL	
TRAVEL_LIMIT_UP_ON	**169**	S	r/w	ALL	
USER_CHARACT	**203**	S	r/w	ALL	Element: Parameter name 0: X_0 1: Y_0 … 20: X_10 21: Y_10
ZERO_POINT_LIMIT	**197**	S	r/w	ALL	

Parameter index

Index	Parameter
160	PIN_POSITION
161	INIT_METHOD
162	SUB_MODE_INIT
163	DEVICE_INIT_STATE
164	MOVING_DIRECTION
165	CLOSING_DIRECTION
166	BLOCKING_POSITION
167	SELF_CALIB_WARNING

Index	Parameter
168	TRAVEL_LIMIT_LOW_ON
169	TRAVEL_LIMIT_UP_ON
170	SETP_CUTOFF_INC_ON
171	SETP_CUTOFF_DEC_ON
172	TRANSDUCER_STATE
173	CHARACT_TYPE
176	SIGNAL_PRESSURE_ ACTION

Index	Parameter
177	PRESSURE_LIMIT
178	SET_FAIL_SAFE_POS
179	FINAL_VALUE_RANGE
180	TOLERANCE_BAND
181	DELAY_TIME
182	STATUS_SOLENOID_ VALVE
183	FINAL_POSITION_VALUE

Description

State of the Transducer Block

Enables the lower x-limit.

Enables the upper x-limit.

User-defined characteristic

Indicates the zero point limit [%].

Index	Parameter
184	FINAL_VALUE
185	DATALOGGER
186	DATALOGGER_READ
187	TEMP_MONITORING
188	STEP_RESPONSE_R
189	STEP_RESPONSE_RW
190	EVENT_LOGGING_1
191	EVENT_LOGGING_2

Index	Parameter
192	ENHANCED_DIAG_CMD
193	ELAPSED_HOURS_ METERS
194	AUTOSTART_HYST
195	DIAGNOSE_LEVEL
196	NO_OF_ZERO_ POINT_ADJ
197	ZERO_POINT_LIMIT
198	COUNTER_INIT_START

Index	Parameter
199	HISTOGRAMM_X_ ABTASTRATE
200	HISTOGRAMM_E_ ABTASTRATE
201	DIAG_TESTINFO
202	DEVICE_CHARACT
203	USER_CHARACT
204	STAT_KENNLINIE_RW

DI1/2 Function Block, Slot 2/3 · Profile-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [Default value]
ALARM_SUM	**23**		r		[0]
ALERT_KEY	**20**	S	r/w	ALL	[0]
BATCH	**24**	S	r/w	ALL	
BLOCK_OBJECT	**16**		r		
CHANNEL	**30**	S	r/w	ALL	DI1: 0 = Not active 780 = Active DI2: 0 = Not active 524 = Active
FSAFE_TYPE	**36**	S	r/w	ALL	0 = Status: UNCERTAIN – substitute value . . . . [1] = Status: UNCERTAIN – last useable value . . 2 = Status: BAD . . . . .
FSAFE_VAL_D	**37**	S	r/w	ALL	[0]
INVERT	**31**	S	r/w	ALL	[0] = Not inverted 1 = Inverted
MODE_BLK	**22**		r		
OUT_D *	**26**	S	r/w	ALL	
SIMULATE	**40**	S	r/w	ALL	[disabled]
ST_REV	**17**		r		[0]
STRATEGY	**19**	S	r/w	ALL	[0]
TAG_DESC	**18**	S	r/w	ALL	[32 user-definable characters]
TARGET_MODE	**21**	S	r/w	ALL	8 = AUTO (automatic) 16 = MAN (manual) 128 = O/S (out of service)
VIEW1	**240**		r		

Parameter index

Index	Parameter
16	BLOCK_OBJECT
17	ST_REV
18	TAG_DESC

Index	Parameter
19	STRATEGY
20	ALERT_KEY
21	TARGET_MODE

Index	Parameter
22	MODE_BLK
23	ALARM_SUM
24	BATCH

Description
Indicates the current states of the process alarms in the DI Function Block.
Contains the ID number of the plant unit.
Contains the identification of the batch process.
Links the Function Block with its associated Transducer Block.
Defines the reaction of the device when an error occurs . . . FSAFE_VALUE is used instead of OUT_D . . . Use of the last valid value of OUT_D . . . OUT_D does not have a valid value
Default value for OUT_D when the sensor or the sensor electronics error is detected.
Inverts the input value PV_D (sent by DI Transducer Block) before it is saved in the OUT_D parameter and sent.
Indicates the actual mode.
This parameter is the output of the Function Block. It can be defined by the user in MAN mode.
The input value (PV_D) issued by the Transducer Block can be simulated for test purposes. This also results in DI Transducer Block and the DI Function Block being disconnected.
Indicates the revision level of static data.
This parameter is used to group blocks for their faster analysis. Blocks are grouped by entering the same value in the STRATEGY parameter of each block.
Used to enter a user-selected text to identify and assign blocks.
Desired mode of operation
Collective command allowing a group of parameters to be read with one single read-service.

Index	Parameter
26	OUT_D
30	CHANNEL
31	INVERT

Index	Parameter
36	FSAFE_TYPE
37	FSAFE_VAL_D
40	SIMULATE

Index	Parameter
240	VIEW1

DI1 Transducer Block, Slot 2 · Profile-specific parameters
DI2 Transducer Block, Slot 3 · Profile-specific parameters

Parameter	Index	SK	Access	Mode	Selection/display [default value]
ALARM_SUM	**67**		r		[0]
ALERT_KEY	**64**	S	r/w	ALL	[0]
BLOCK_OBJECT	**60**		r		
MODE_BLK	**66**		r		
PV_D	**72**		r		
SENSOR_ID	**69**	S	r/w	ALL	
SENSOR_MAN	**71**	S	r/w	ALL	
SENSOR_SER_NUM	**70**	S	r/w	ALL	
SENSOR_WIRE_CHECK	**68**	S	r/w	ALL	Detection of … 0 = Lead breakage and short circuit enabled 1 = Lead breakage enabled, short circuit disabled 2 = Lead breakage disabled, short circuit enabled 3 = Lead breakage and short circuit disabled
ST_REV	**61**		r		[0]
STRATEGY	**63**	S	r/w	ALL	[0]
TAG_DESC	**62**	S	r/w	ALL	[32 user-definable characters]
TARGET_MODE	**65**	S	r/w	ALL	8 = AUTO (automatic) 128 = O/S (out of service)
VIEW1	**241**		r		

Parameter index

Index	Parameter
60	BLOCK_OBJECT
61	ST_REV
62	TAG_DESC

Index	Parameter
63	STRATEGY
64	ALERT_KEY
65	TARGET_MODE

Index	Parameter
66	MODE_BLK
67	ALARM_SUM
68	SENSOR_WIRE_CHECK

Description

This parameter contains the measured logical value and its status which are available to the Function Block.

Identification of the sensor (type)

Manufacturer of the sensor

Serial number of the sensor

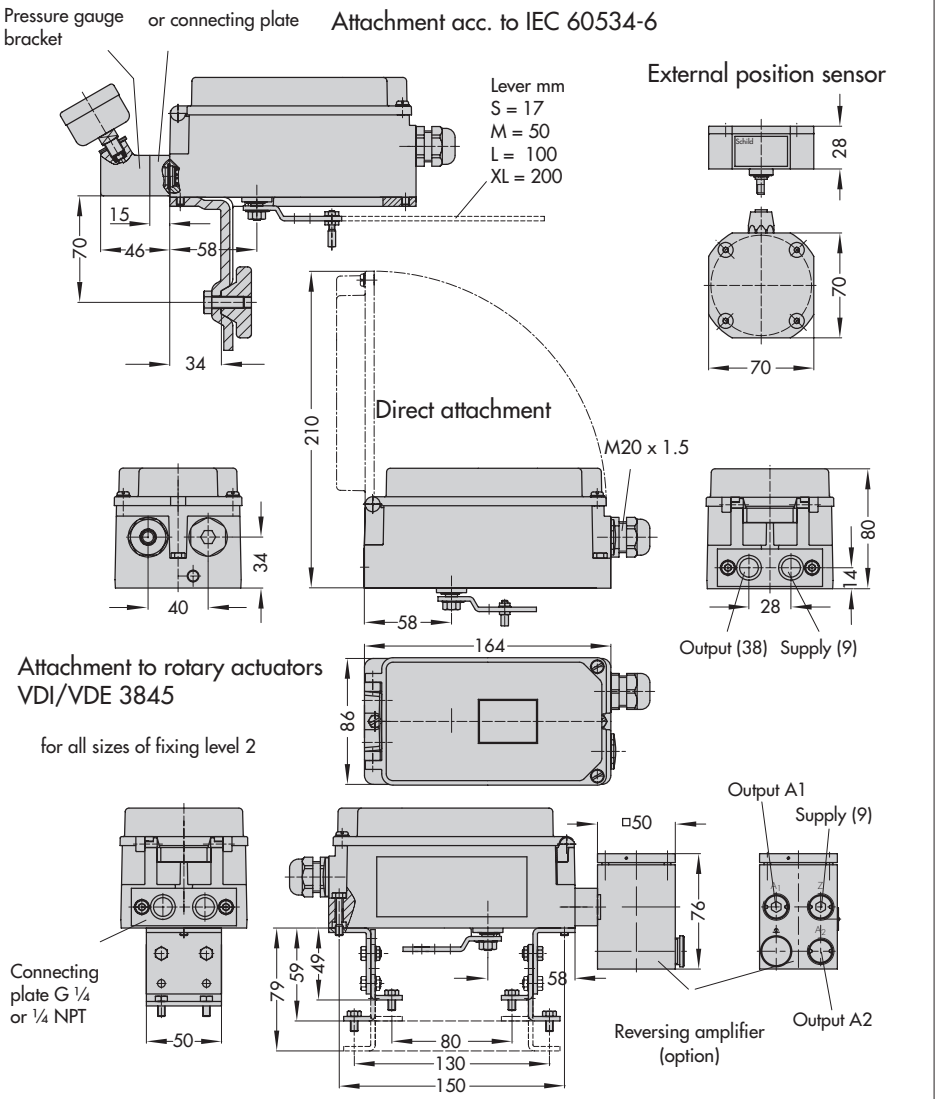
Enables the lead breakage and short circuit detection.

Collective command allowing a group of parameters to be read with one single read-service.

Index	Parameter
69	SENSOR_ID
70	SENSOR_SER_NUM
71	SENSOR_MAN

Index	Parameter
72	PV_D
241	VIEW1

15 Dimensions in mm



VDE

VDE Prüf und Zertifizierungsinstitut

TRANSLATION

Offenbach, 2005-11-21

Your ref.	Your letter	Our ref.	Contact
P. Opl	2005-11-08	479000-9010-0001/67325 FG33/bhl-wah	H. Biehl Tel. (069) 8306-249 Fax (069) 8306-716 gerhard.biehl@vde.com

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

VDE

VDE Prüf und Zertifizierungsinstitut

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: 479000-9010-0001/32752 and on the Type 3731 Positioner under the reference number: 479000-9010-0001/58985 with suction as per category 1 at the connecting enclosures of the positioners and solenoid valves. The under pressure was 2 kPa 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

VDE VERBAND DER ELEKTROTECHNIK
ELEKTRONIK INFORMATIONSTECHNIK e.V

Testing and Certification Institute
Merianstrasse 28
D-63069 Offenbach

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 06.0054** Issue No.: **0**

Status: **Current**

Date of Issue: **2006-11-02** Page **1** of **4**

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

Electrical Apparatus: **Bus-powered field i/p-Positioners types 3730-41 and 3730-51**
Optional accessory:

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

Marking: **Ex ia IIC T6**

Approved for issue on behalf of the IECEx Certification Body. Dr.-Ing. Ulrich Johannsmeyer

Position: Department Head of "Intrinsic Safety and Safety of Systems"

Signature:
(for 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 06.0054**

Date of Issue: **2006-11-02** Issue No.: **0**

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 : 2004 Edition: 4.0	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 'i'

*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

Test Report:

DE/PTB/EXTR06.0086/00

Quality Assessment Report:

DE/TUN/QAR06.0011/00

Schedule

EQUIPMENT:
Equipment and systems covered by this certificate are as follows:

The Model **3730-41 and 3730-51** i/p-Positioners are bus-powered field devices with communication capability and serve for adjusting the valve stem positions in compliance with a control signal. They are intended for attachment to either linear or rotary actuators.

Communication with field devices programmable logic control systems and distributed control systems is optionally either according to Profibus PA (Model 3730-41 . .), or in accordance with the FOUNDATION™ Fieldbus Specification (Typ 3730-51 . .).

For further information see annexe.

CONDITIONS OF CERTIFICATION: NO

IECEx Certificate of Conformity

Certificate No.: IECEx PTB 06.0054

Date of Issue: 2006-11-02 Issue No.: 0

Additional information:

for further information see annex

Annexe: 3730-41_51 Technical Data.pdf

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

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TRANSLATION

(1) **EC TYPE EXAMINATION CERTIFICATION**

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**

(3) EC Type Examination Certificate Number

PTB 04 ATEX 2109

(4) Equipment: Model 3730-4.. and 3730-5.. I/P Positioners

(5) Manufacturer: SAMSON AG, Mess- und Regeltechnik

(6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

(7) The equipment and any acceptable variations thereof are specified in the schedule to this certificate.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 in according to 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 as specified in Annex II to the Directive.

The examination and test results are recorded in confidential report PTB Ex 04-24202.

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

EN 50014:1997+A1+A2 EN 50020:2002 EN 50281-1-1:1998

(10) If the sign "X" 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.

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(11) This EC Type Examination Certificate relates only to the design and examination of the specified equipment in compliance with Directive 94/9/EC Further requirements of this Directive apply to the manufacture and supply of this equipment. These requirements are not covered by this Certificate.

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

II 2G EEx ia IIC T6 and II 2D IP 65 T 80 °C

Zertifizierungsstelle Explosionsschutz Braunschweig, 25 October 2004
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

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

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Ptb47-3730-41-51.doc

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

(14) **EC TYPE EXAMINATION CERTIFICATE No. PTB 04 ATEX 2109**

(15) **Description of Equipment**

The Model 3730-4 and 3730-5.. I/P Positioners are bus-powered field devices with communication capability and serve for adjusting valve stem positions in compliance with a control signal. They are intended for attachment to linear or rotary actuators.

Communication is optionally either according to Profibus PA incompliance with the FISCO concept (Model 3730-4..) or in compliance with the FOUNDATION™ Fieldbus Specification (Model 3730-5..)

The Model 3730-4.. and 3730-5.. I/P Positioners are passive two-terminal networks which may be connected to any certified intrinsically safe circuit, provided the permissible maximum values for Ui, Ii and Pi are not exceeded.

For air supply non-combustible media are used.

The devices are intended for use inside the hazardous locations.

The correlation between temperature classification, permissible temperature ranges is shown in the tables below:

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

Electrical data

BUS connection, signal circuit (terminals 11/12)

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

The correlation between type of protection and the electrical data is shown I the table

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Maximum values:
Model 3730-4..

EEx ia IIC/IIB
Ui 17,5 V DC
Ii = 380 mA
Pi = 5.32 W

or
Model 3730-5..

FOUNDATION™	
EEx ia IIC	EEx ia IIB
Ui = 24 v DC	Ui = 24 DC
Ii = 360 mA	Ii = 380 mA
Pi = 5.32 W	Pi = 2.58 W

Ci = 5 nF; Li = 10 µH

Inductive proximity switch (terminals 11/12)

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

Maximum values

Ui = 16 V
Ii = 52 mA
Pi = 169 mW

Li = 100 µH
Ci = 30 nF

or

Ui = 16 V
Ii = 25 mA
Pi = 64 mA

Li = 100 µH
Ci = 30 nF

The correlation between temperature classification, the permissible ambient temperature ranges, the maximum short-circuit currents and the maximum power for analyzers is shown in the table below

EC Type Examination Certificates without signature and seal are invalid.
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Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

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Ptb47-3730-41-51.doc

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

Forced venting function (terminals 81/82)

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

Maximum values:

Ui = 28 V
Ii = 115 mA
Pi 500 W

Li = negligible
Ci = 5.3 nF

Binary input 1 (terminals 87 / 88)

Type of protection: Intrinsic safety EEx ia IIC/IIB for connection of an active contact circuit

Maximum values:

Ui = 30 V
Ii = 100 mA

Li = negligible
Ci = negligible

Binary input 2 (terminals 85 / 86)

Type of protection: Intrinsic safety EEx ia IIC/IIB for connection of an active contact circuit

Maximum values:

U_0 = 5,88 V
I_0 = 1 mA
P_0 = 7,2 mW

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The correlation between the type of protection and the permissible maximum allowed capacitances and inductances is shown in the table below

EEx ia IIC	EEx ia IIB
C_0 = 2 µF	C_0 = 4 µF
L_0 = 10 mH	L_0 = 1 H

Ci = negligible
Li = negligible

Serial interface BU

Type of protection. intrinsic safety EEx ia IIC

U_0 = 8,61 V
I_0 = 55 mA
P_0 = 250 mW

The correlation between the type of protection and the permissible maximum allowed capacitances and inductances is shown in the table below

EEx ia IIC	EEx ia IIB
C_0 = 0,61 µF	C_0 = 4 µF
L_0 = 9 mH	L_0 = 9 mH

only for connection to a certified intrinsically safe circuit

Maximum values:

Ui = 16 V
Ii = 25 mA
Pi = 64 mW

Li = negligible
Ci = negligible

For interconnection, the rules for interconnecting intrinsically safe circuits shall be complied with

External positioner sensor (analog PCB pins p9, p10, p11)

Type of protection: Intrinsic safety EEx ia IIC

Maximum values:

U_0 = 8,61 V
I_0 = 55 mA
P_0 = 250 mW

The correlation between the type of protection and the permissible maximum allowed capacitances and inductances is shown in the table below

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Ptb47-3730-41-51.doc

EEx ia IIC	EEx ia IIB
C_o = 0,61 µF	C_o = 4 µF
L_o = 9 mH	L_o = 9 mH

L_i = 370 µH
C_i = 730 nF

(16) Test Report: **PTB Ex 04-24202**

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

None

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

In compliance with the standards specified above.

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 25 October 2004

(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

TRANSLATION

ADDENDUM No.: 1

in compliance with Directive 94/9/EC Annex III Clause 6
to the EC Type Examination Certificate PTB 04 ATEX 2109

Equipment:	Model 3730-41.. and 3730-51
Marking:	**II 2G EEx ia IIC T6 and** **II 2D IP 65 T80°C**
Manufacturer:	SAMSON AG Mess- und Regeltechnik
Address:	Weismüllerstr. 3, D-60314 Frankfurt, Germany

1. Description of the additions and modifications

The Model 3730-4.. and 3730-5.. are permitted to be manufactured in the future also in compliance with the documents specified in the Test Report. The input wiring of the bus connection circuit has been modified and the pcb layout has been adapted.

The clause below replaces Clause (15) Para. 2 of the EC Type Examination Certificate.

"Bus connection (coupling) can be made according to the FISCO Concept both for the Profibus PA and the Foundation ™ Fieldbus Specification."

The tabular presentation of the electrical data relating to the bus connection signal circuit has been modified:

"BUS connection signal circuit … (Terminals 11/12)	Type of protection EEx ia IIC/IIB only for connection to a certified intrinsically safe circuit.

The interrelationship between type of protection and the electrical data is shown in the table below.

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Addendum No. 1 to the EC Type Examination Certificate PTB 04 ATEX 2109

Maximum values:

Model 3730-4 .. and 3730-5 .. resp.

FISCO supply unit	BUS supply unit, general	
EEx ia IIC/IIB	EEx ia IIC	EEx ia IIB
U_i = 17,5 V DC	U_i = 24 V DC	U_i = 24 V DC
I_i = 380 mA	I_i = 360 mA	I_i = 380 mA
P_i = 5,32 W	P_i = 1,04 W	P_i = 2,56 W

C_i = 5 nF
L_i = 10µH

All the other electrical data and other data specified in the EC Type Examination certificate apply also this Amendment No. 1

Test report: **PTB Ex 06-26085**

Zertifizierungsstelle Explosionsschutz
By order

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

Braunschweig, 13 July 2005

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Braunschweig und Berlin

PTB

TRANSLATION

(1) **Statement of Conformity**

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**

(3) EC Type Examination Certificate Number

PTB 05 ATEX 2010 X

(4) Equipment: Model 3730-48.. and 3730-58.. Positioners

(5) Manufacturer: SAMSON AG, Mess- und Regeltechnik

(6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

(7) The equipment and any acceptable variations thereof are specified in the schedule to this certificate.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 in according to 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 as specified in Annex II to the Directive.

The examination and test results are recorded in confidential report PTB Ex 05-24319.

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

EN 50021:1999 EN 50281-1-1:1998

(10) If the sign "X" 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.

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

(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 the equipment.

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

II 3G EEx nA II T6 or II 3G EEx nL IIC T6 or
II 3D IP 54 T 80 °C or II 2D IP 65 T 80 °C

Zertifizierungsstelle Explosionsschutz Braunschweig, 16 February 2005
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

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(13) **Schedule**

(14) **EC TYPE EXAMINATION CERTIFICATE No PTB 05 ATEX 2010 X**

(15) **Description of Equipment**

The Model 3730-48 and 3730-58.. Positioners are bus-powered field devices with communication capability and serve for translating control signals into valve stem positions. They are intended for attachment to linear or rotary actuators.

For instrument air non-combustible media are used.

The equipment is intended for use inside the hazardous locations.

The correlation between temperature classification, permissible temperature ranges is shown in the tables below:

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

Electrical data

BUS connection, signal circuit (terminals 11/12)

Type of protection: EEx nA II or Ex nL IIC resp.

Gas group	Maximum values
IIC	U_o = 20V; I_o = 464mA, P_o = 2,32W U_o = 24V; I_o = 261mA, P_o = 1,56W U_o = 30V; I_o = 152mA, P_o = 1,14W
IIB	U_o 20V; I_o 1,17A, P_o 5,88W U_o = 24V; I_o = 650mA, P_o = 3,89W U_o = 30V; I_o = 379mA, P_o = 2,85W

Ci = 5 nF; Li = 10 μH

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Braunschweig und Berlin

PTB

Inductive proximity switch (terminals 41/42)

Type of protection: EEx nA II or Ex nL IIC resp.

Maximum values

Ui = 20 V
Ii 52 A
Pi 169 W

Li = 100μH
Ci = 30nF

The correlation between temperature classification, the permissible ambient temperature ranges, the maximum short-circuit currents and the maximum power for analyzers is shown in the table below

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

Forced venting function (terminals 81/82)

Type of protection: EEx nA II or Ex nL IIC/IIB resp.

Maximum values:

Ui = 30 V
Ii = 100 mA

Li = negligible
Ci = 5.3 nF

Binary input 1 (terminals 87 / 88)

Type of protection: EEx nA II or Ex nL IIC/IIB resp

Maximum values:

Ui = 30 V
Ii = 100 mA

Li = negligible
Ci = negligible

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Binary input 2
(terminals 85 / 86)

Type of protection: EEx nA II or Ex nL IIC/IIB resp.
only for connection of a floating passive contact circuit

Maximum values:

U_o = 5,88 V
I_o = 1 mA
P_o = 7,2 mW

The correlation between the gas group and the permissible maximum allowed capacitances and inductances is shown in the table below

Gas group IIC	Gas group IIB
C_o = 1,8µF	C_o = 15,8µF
L_o = 9,7mH	L_o = 1H

C_i = negligible
L_i = negligible

Serial interface BU

Type of protection: EEx nA II or Ex nL IIC/IIB resp.

Maximum values (active):

U_o = 8,61 V
I_o = 55 mA
P_o = 250 mW

The correlation between the gas group and the permissible maximum allowed capacitances and inductances is shown in the table below

Gas group IIC	Gas group IIB
C_o = 0,61µF	C_o = 4µF
L_o = 9mH	L_o = 9mH

Maximum values (passive):

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

L_i = negligible
C_i = negligible

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

External positioner sensor
(analog PCB pins p9, p10, p11)

Type of protection: EEx nA II or Ex nL IIC/IIB resp.

Maximum values (active):

U_o = 8,61 V
I_o = 55 mA
P_o = 250 mW

The correlation between the gas group and the permissible maximum allowed capacitances and inductances is shown in the table below

Gas group IIC	Gas group IIB
C_o = 0,61µF	C_o = 4µF
L_o = 9mH	L_o = 9mH

L_i = 370µH
C_i = 730nF

(16) Test Report: **PTB Ex 05-24319**

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

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

In compliance with the standards specified above.

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 16 February 2005

(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

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Physikalisch-Technische Bundesanstalt., Bundesallee 100, D-38116 Braunschweig

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

ADDENDUM No. 1

to the Statement of Conformity PTB 05 ATEX 2010 X

Equipment: Model 3730-48.. and 3730-58 Positioners

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

Manufacturer: SAMSON AG Mess- und Regeltechnik

Address: Weismüllerstr. 3
60314 Frankfurt am Main

Description of the additions and modifications

The Model 3730-48.. and 3730-58.Positioners are permitted to be manufactured in the future also in compliance with the documents specified in the Test Report. The input wiring of the bus connection circuit has been modified and the pcb layout has been adapted.

The clause below supplements the description of the equipment under clause (15) Para. 2 of the EC Type Examination Certificate.

"BUS connection (coupling) can be made according to the FISCO Concept both for the Profibus PA and the Foundation ™ Fieldbus Specification."

The electrical data, special conditions and all the other data of the EC Type Examination Certificate continue to apply unaltered also to this Addendum No. 1.

Test report: PTB **Ex 06-26086**

Zertifizierungsstelle Explosionsschutz Braunschweig, 13, July 2006
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Director and Professor

Installation Manual for apparatus certified by CSA for use in hazardous locations.
Communication is optionally either according to the **FOUNDATION**^{TM} Fieldbus Specification **or** according to **PROFIBUS PA** in compliance **FISCO-Concept**

The **FISCO Concept** allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage **(Vmax)** the current **(Imax)** and the power **(Pmax)** which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage **(Voc)** the current **(Isc)** and the power **(Po)** levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance **(Ci)** and inductance **(Li)** of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to **5 nF** and **10 µH** respectively.
In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system The allowed voltage **(Voc)** of the associated apparatus is limited to the range of **14V DC**. to **24V DC**. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except to a leakage current of 50mA for each connected device. Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.

The cable used to interconnect the devices need to have the parameters in the following range:

Loop resistance R':	15 ... 150 Ohm/km
Inductance per unit length L':	0,4 ... 1 mH/km
Capacitance per unit length C':	80 ... 200 nF/km

C' = C' line/line + 0,5 C' line/screen, if both lines are floating or, C' = C' line/line + C'line/screen, if the screen is connected to one line

Length of spur cable:	≤ 30 m
Length of trunk cable:	≤ 1 km

At each end of the trunk cable an approved infallible line termination with the following parameters is suitable:

R = 90 ... 100 Ohm C = 0 ... 2,2 µF

One of the allowed terminations might already be integrated in the associated apparatus.

The number of passive devices connected to the bus segment is not limited due to I.S. reasons. If the above rules are respected, the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

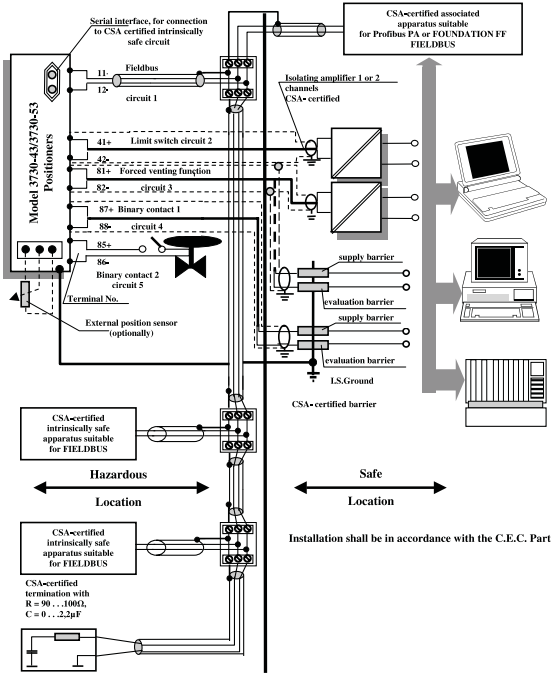
Notes:

1. Approved associated apparatus must be installed in accordance with manufacturer instructions
2. Approved associated apparatus must meet the following requirements:
   $V_{oc} \leq V_{max}$, $I_{sc} \leq I_{max}$, $P_o \leq P_{max}$
3. The maximum non-hazardous area voltage must not exceed 250 V.
4. The installation must be in accordance with the Canadian Electrical code Part 1.
5. Each set of wires must be provided with grounded shield. The shield must extend as close to the terminal(s) as possible and it must be grounded shield at I. S. Barrier ground.
6. Caution: Use only supply wires suitable for 5 °C above surrounding.
7. Warning: Substitution of components may impair intrinsic safety. PE = I. S. Ground
8. The polarity for connecting 11 and 12 is of no importance due to an internal rectifier.
9. FISCO concept applies to fieldbus / circuit only.
10. Entity parameters apply to circuit 2, 3 and 4 and further required to meet the following conditions:
    $C_o \geq C_i + C_{cable}$; $L_o \geq L_i + L_{cable}$

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

CSA- certified for hazardous locations **Type 4 Enclosure**

Ex ia IIC T6
Class I, Division 1, Groups A, B, C and D; Class II, Division 1, Groups E, F + G; Class III.



Installation shall be in accordance with the C.E.C. Part 1

Table 1: Intrinsic Safety Parameters

	Fieldbus				Limit-switches inductive	Forced venting-function	Binary- input		Serial-Interface	
	Foundation		Profibus				1	2	Active	Passive
Circuit No.	1		1		2	3	4	5	6	6
Terminal No.	11 / 12 (IEC 1148-2)		11 / 12 (IEC 1148-2)		41 / 42	81 / 82	87 / 87	85 / 86	plug	
Groups	IIC	IIB	IIC	IIB	##	##	##	##	##	##
V_{max} [V]	24		17,5		16	28 30	28 30	###	###	16
U_0 or V_{OC}	##							5,88V	8,61V	###
I_{max} [mA]	360	380	380		25 52	115 100	115 100	###	###	25
I_0 or I_{SC}	##							1mA	55mA	###
P_{max} [W]	1,04	2,58	5,32		64mW 169mW	##	##	7,2 mW	250 mW	64 mW
C_i [nF]	2				60	5,3	0	###	###	0
C_0 or Ca	##							2µF	0,61µF	###
L_i [µH]	10				100	0	0	###	###	0
L_0 or La	##							10mH	9mH	###

Binary- input 1: For connection of an active signal circuit

Binary- input 2: For connection of an passive contact circuit directly on the control valve, e.g. passive pressure switch for leakage monitoring

Notes:

1. Entity parameters must meet the following requirements:

   $V_{OC} \leq V_{max}$, $I_{SC} \leq I_{max}$, $P_0 \leq P_{max}$
   C_0 or $C_a \geq C_i + C_{cable}$ and L_0 or $L_a \geq L_i + L_{cable}$

2. Install in accordance with the Canadian Electrical Code Part I

3. Cable entry M 20 x1,5 or metal conduit acc. to dwg. No. 1050-0540

* Circuit 3 can be connected to a CSA Certified zener barrier that is rated as follows:
- Supply channel (connect to Terminal 81): $V_{OC} \leq$ 28V max. and Rmin $\geq$ 245 Ω
- Return channel (connect to Terminal 82): $\leq$ 28V max with diodes Return (zero current)

** Circuit 4 can be connected to a CSA Certified zener barrier that is rated as follows:
- Supply channel (connect to Terminal 87): Voc $\leq$ 30V and Rmin $\geq$ 300 Ω
- Return channel (connect to Terminal 88): Voc $\leq$ 30V max with diodes Return (zero current)

Table 2: CSA – certified barrier parameters of circuit 4

Barrier	Supply barrier		Evaluation barrier	
	V_{OC}	R_{min}	V_{OC}	R_{min}
circuit 3	≤28V	≥245Ω	≤28V	Diode
circuit 4	≤30V	≥300Ω	≤30V	Diode

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

Table 3:

Temperature class	Permissble ambient temperature range
T6	+60°C
T5	-40°C ≤ T_a ≤+70°C
T4	+80°C

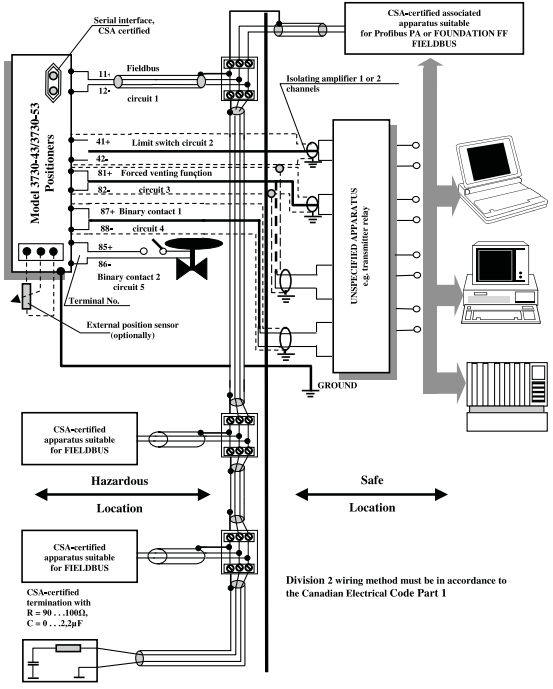
Table 4: Energy-Limited (Non- Incendive) Parameters

	Foundation Fieldbus or Profibus PA (Non incendive Equipment)								Limit-switches (inductive)	Forced venting function	Binary-Input 1	Maximum values for serial-interface and binary input 2 see table 1
Terminal	11 / 12 (IEC 1148-2)								41 / 42	81 / 82	87 / 88	
Groups	A, B and IIC				C, D and IIB				#/#	#/#	#/#	
U_i or V_{max} [VDC]	20V	24V	30V	32V	20V	24V	30V	32V	20V	28V 30V 32V	28V 30V 32V	
I_i or I_{max} [mA]	464	261	152	130	1,117 A	650	379	324	25mA 52mA	115mA 100mA 90mA	115mA 100mA 90mA	
P_i or P_{max} [W]	2,32	1,56	1,14	1,14	5,88	3,89	3,85	2,77	64mW 169mW	##	##	
C_i	2nF								30	5,3	0	
L_i	10µH								100	0	0	

CSA certified for hazardous locations:

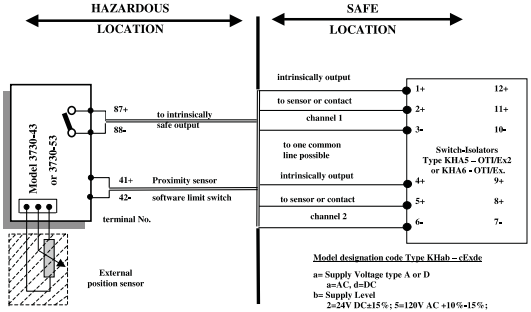
Ex nA II T6 / Ex nL IIC T6
Class I, Div. 2; Groups A, B, C, D; Class II, Div. 2 Groups E, F + G; Class III

Type 4 Enclosure



Division 2 wiring method must be in accordance to the Canadian Electrical Code Part 1

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



Model designation code Type KHab – cExde

a= Supply Voltage type A or D
a=AC, d=DC
b= Supply Level
2=24V DC±15%; 5=120V AC +10%-15%;
6=230V AC+10%-15%;
c= Output type RTA/; RW1/; SS1/; SS2/; RS1/; SR/; ST-or SOT
d= Number of channels 1 or 2
e= Power rail designation, P, 2S.P or GS.P (includes Model KHD2-EB-PB Power Feed Module) or Blank

The total series inductance and shunt capacitance of shield wiring shall be restricted to the following maximum values

maximum capacitance of each inductive sensor 30nF
maximum inductance of each inductive sensor 100µH

System parameters

Control Relay Terminal No.	Groups	L [mH]	C [µF]	V_{OC} [V]	I_{SC} [mA]	V_{max} [V]	R_{min} [Ω]
1-3; 2-3 4-6; 5-6	A + B	192	2,66	↑ 10,5 ↓	↑ 13 ↓	↑ 10,5 ↓	↑ 811 ↓
	C + E	671	7,9				
	D, F, G	1000	21,3				

Division 2 wiring method shall be in accordance to the Canadian Electrical Code Part 1.

Installation Manual for apparatus approved by FM for use in hazardous locations.
Communication is optionally either according to the **FOUNDATION**™ Fieldbus Specification or according to **PROFIBUS PA** in compliance **FISCO-Concept**

The **FISCO Concept** allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage (**Vmax/Ui**) the current (**Imax/Ii**) and the power (**Pi**) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (**Voc/Uo**) the current (**Isc/Io**) and the power (**Po**) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (**Ci**) and inductance (**Li**) of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to **5 nF** and **10 µH** respectively.
In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system The allowed voltage (**Voc /Uo)** of the associated apparatus is limited to the range of **14V DC**. to **24V DC**. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except to a leakage current of 50mA for each connected device. Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.

The cable used to interconnect the devices need to have the parameters in the following range:

Loop resistance R':	15 ... 150 Ohm/km
Inductance per unit length L':	0,4 ... 1 mH/km
Capacitance per unit length C':	80 ... 200 nF/km

C' = C' line/line + 0,5 C' line/screen, if both lines are floating or, C' = C' line/line + C'line/screen, if the screen is connected to one line

Length of spur cable:	≤ 30 m
Length of trunk cable:	≤ 1 km

At each end of the trunk cable an approved infallible line termination with the following parameters is suitable:

R = 90 ... 100 Ohm	C = 0 ... 2,2 µF

One of the allowed terminations might already be integrated in the associated apparatus.

The number of passive devices connected to the bus segment is not limited due to I.S. reasons. If the above rules are respected, the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

Notes:

1. Approved associated apparatus must be installed in accordance with manufacturer instructions
2. Approved associated apparatus must meet the following requirements:
   Uo or Voc ≤ Ui or **Vmax**, **Io or Isc ≤ Ii** or **Imax**, **Po ≤ Pi** or **Pmax**
3. The maximum non-hazardous area voltage must not exceed 250 V.
4. The installation must be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01
5. Each set of wires must be provided with grounded shield. The shield must extend as close to the terminal(s) as possible and it must be grounded shield at I. S. Barrier ground.
6. Caution: Use only supply wires suitable for 5 °C above surrounding.
7. Warning: Substitution of components may impair intrinsic safety. PE = I. S. Ground
8. The polarity for connecting 11 and 12 is of no importance due to an internal rectifier.
9. FISCO concept applies to fieldbus / circuit only.
10. Entity parameters apply to circuit 2, 3 and 4 and further required to meet the following conditions:
    Co ≥ Ci + Ccable; **Lo ≥ Li + Lcable**

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

FM- approved for hazardous locations

Class I, Zone 0 AEx ia IIC T6:
Class I, II, III Div. 1, Groups A, B, C, D, E, F + G. **Field enclosure NEMA 4X**

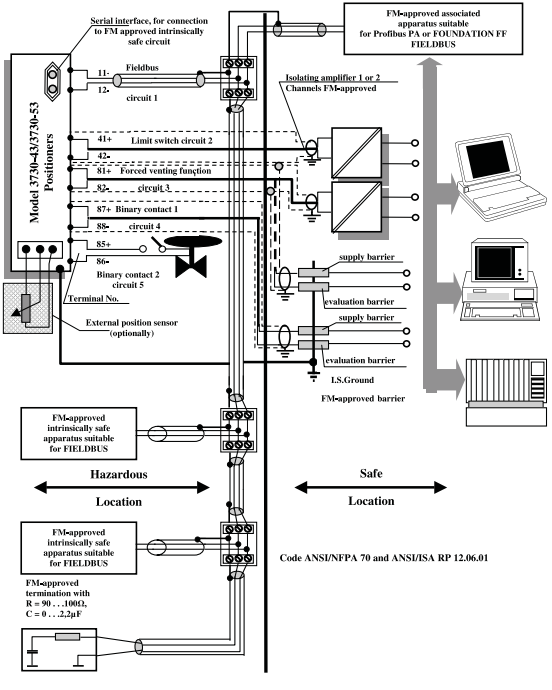


Table 1: Maximum values

	Fieldbus			Limit-switches inductive	Forced venting-function	Binary- input		Serial-Interface	
	Foundation		Profibus			1	2	active	passive
Circuit No.	1		1	2	3	4	5	6	6
Terminal No.	11 / 12		11 / 12	41 / 42	81 / 82	87 / 88	85 / 86	plug	
Groups	A, B IIC	C, D IIB	A, B, C, D IIC / IIB	#/#	#/#	#/#	#/#	#/#	#/#
U_i or V_{max} [V]	24		17,5	16	28	30	V_{OC} 5,88	V_{OC} 8,61	V_{max} 16
I_i or I_{max} [mA]	360	380	380	25	115	100	I_{SC} 1	I_{SC} 55	I_{max} 25
P_i or P_{max} [W]	1,04	2,58	5,32	64 mW	##	##	7,2 mW	250 mW	64 mW
C_i [nF]	5			60	5,3	0	2µF	0,61µF	0
L_i [µH]	10			100	0	0	10mH	9mH	0

Binary- input 1: For connection of an active signal circuit

Binary- input 2: For connection of an passive contact circuit directly on the control valve, e.g. passive pressure switch for leakage monitoring

Notes:

1. Entity parameters must meet the following requirements:

   $U_0 \leq U_i$ or V_{max} , $I_0 \leq I_i$ or I_{max}, $P_0 \leq P_i$ or P_{max}
   C_0 or $C_a \geq C_i + C_{cable}$ and L_0 or $L_a \geq L_i + L_{cable}$

2. The installation must be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01

3. Cable entry M 20 x1,5 or metal conduit acc. to dwg. No. 1050-0540

Table 2: FM – approved barrier parameters of circuit 4

Barrier	Supply barrier				Evaluation barrier	
	V_{OC}	R_{min}	I_{OC}	P_{max}	V_{OC}	R_{min}
circuit 3	≤28V	≥245Ω	≤115mA	##	≤28V	Diode
circuit 4	≤30V	≥300Ω	≤100mA	##	≤30V	Diode

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

Table 3:

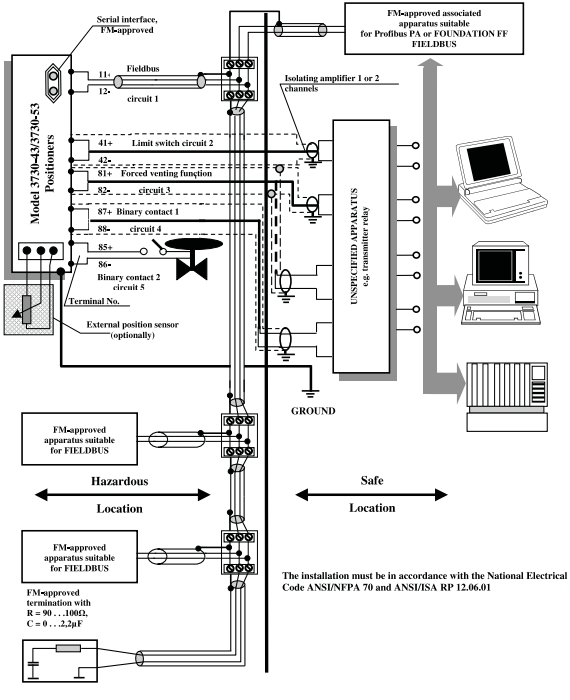
Temperature class	Permissble ambient temperature range
T6	+60°C
T5	-40°C ≤ T_a ≤+70°C
T4	+80°C

Table 4:

	Foundation Fieldbus or Profibus PA (Non incendive Field wiring)								Limit-switches (inductive)	Forced venting function	Binary-Input 1	Maximum values for serial-interface and binary input 2 see table 1
Terminal	11 / 12								41 / 42	81 / 82	87 / 88	
Groups	A, B and IIC				C, D and IIB				#/#	#/#	#/#	
U_i or V_{max} [VDC]	20V	24V	30V	32V	20V	24V	30V	32V	20V	30V	30V	
I_i or I_{max} [mA]	464	261	152	130	1,117 A	650	379	324	25mA	100mA	100mA	
P_i or P_{max} [W]	2,32	1,56	1,14	1,14	5,88	3,89	3,85	2,77	64mW	##	##	
C_i	5nF								60	5,3	0	
L_i	10µH								100	0	0	

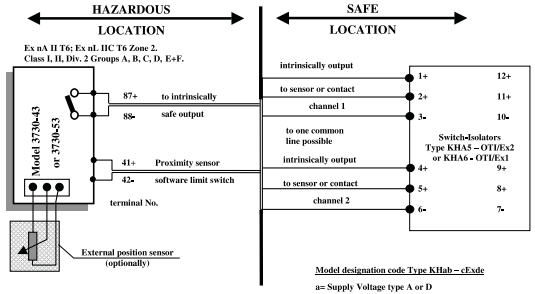
FM approved for hazardous locations:
Ex nA II T6; Ex nL IIC T6 Zone 2.
Class I, II, Div. 2 Groups A, B, C, D, E+F.

Field enclosure NEMA 4X



The installation must be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01

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



maximum capacitance of each inductive sensor 30nF
maximum inductance of each inductive sensor 100µH

Model designation code Type KHab – cExde

a= Supply Voltage type A or D
a=AC, d=DC
b= Supply Level
2=.24V DC±15%; 5=120V AC +10%-15%;
6=230V AC+10%-15%;
c= Output type RTA/; RWI/; SSI/; SS2/; RSI/; SR/; ST-or SOT
d= Number of channels 1 or 2
e= Power rail designation, P, 2S.P or GS.P (includes Model KHD2-EB-PB Power Feed Module) or Blank

Each pair of I.S. wires must be protected by a shield that is grounded at the I.S. Ground. The shield must be extend as close to the terminals as possible installation shall be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01.

The total series inductance and shunt capacitance of shield wiring shall be restricted to the following maximum values

System parameters

Control Relay Terminal No.	Groups	L [mH]	C [µF]	V_{OC} [V]	I_{SC} [mA]	V_{max} [V]	R_{min} [Ω]
1-3; 2-3 4-6; 5-6	A + B	192	2,66	↑	↑	10,5	811
	C + E	671	7,9	10,5 ↓	13 ↓	↓	↓
	D, F, G	1000	21,3	↓	↓	↓	↓

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