MOUNTING AND OPERATING INSTRUCTIONS

EB 8384-4 EN

Translation of original instructions

Old design

New design

Type 3730-4 Electropneumatic Positioner

with PROFIBUS-PA communication

Firmware version K 1.17/R.1.46

CE Ex certified

Edition December 2018

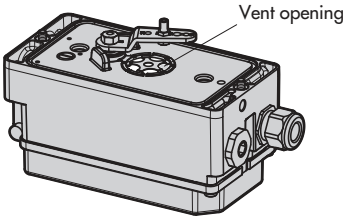
Contents

Modifications to positioner firmware compared to the previous version	
Communication	
Firmware	Modification
K 1.01	Internal modifications
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 1.11	– More trigger conditions in the data logger (see page 142) – 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 94)
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 1.13	Internal modifications
K 1.15	Feature of ID number adaptation acc. to PROFIBUS PA Profile 3.02 added. It allows a Type 3785 Positioner (Profile 2.0 and Profile 3.0) to be directly replaced with a Type 3730-4 Positioner in the compatability mode (see page 95).
K 1.16	The function to suppress extended diagnostic messages allows messages for the PROFIBUS diagnosis protocol to be suppressed. The messages are still included in the condensed state according to their classification. The parameter to suppress the diagnositic messages exists in the following integrations: DD: 2.2.007 TROVIS-VIEW: 3.60.005 (device module) and higher DTM: 1.3.0.1
K 1.17	The versions K1.12 to K1.16 do not save a reference variable received in acyclic data exchange as the valid value for the fail-safe action 'Last valid setpoint is used'. In the affected modules for data exchange, the polling for a valid reference variable has been changed to GOOD_NON_SPECIFIC.
Communication	
Firmware	Modification
R 1.43 to **R 1.46**	Internal modifications

General safety instructions

- *The positioner is to be mounted, started up or operated only by trained and experienced personnel familiar with the product.*
  According to these Mounting and Operating Instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- *Explosion-protected versions of this positioner may only be operated by personnel who have undergone special training or instructions or who are authorized to work on explosion-protected devices in hazardous areas. Refer to section 11 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 the positioner/vent opening facing upwards. The vent opening must not be sealed or restricted when the positioner is installed on site.*



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

Note: *The device with a CE marking fulfills the requirements of the Directives 2014/30/EU and 2011/65/EU as well as the Directive 2014/34/EU, depending on the version. The EU declarations of conformity can be found at the back of these instructions.*

Article code

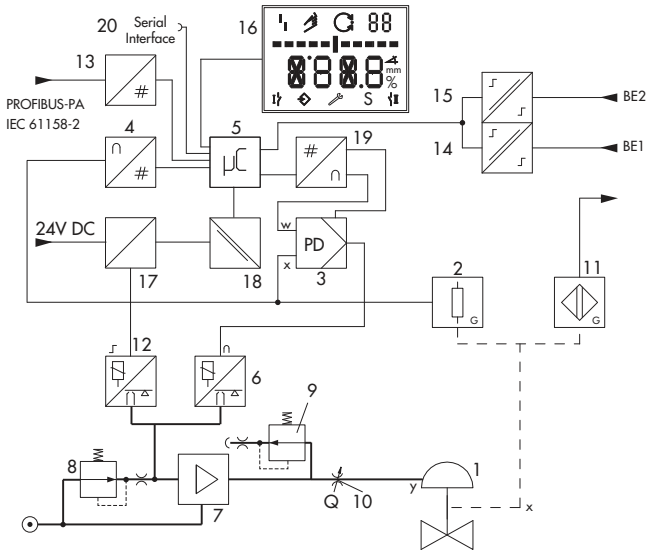
Positioner	**Type 3730-4**	x	x	x	0	x	0	x	x	1	x	0	0	x	0	x	x
With LCD and autotune, PROFIBUS-PA																	
Explosion protection																	
None		0															
ATEX: II 2G Ex ia IIC T6 Gb; II 2D Ex ia IIIC T80°C Db		1															
CSA/FM: Ex ia IIC T6, Class I, II, Div.1, Groups A-G; Ex nA II T6, Ex nL IIC T6; Class I, Div.2, Groups A-D; Class II, Div.1, Groups E-G/ Class I, Zone 0 AEx ia IIC; Class I, II, III, Div.1, Groups A-G; Class I, Div.2, Groups A-D; Class II, Div.2, Groups F, G		3															
ATEX: II 2D Ex tb IIIC T80°C Db		5															
ATEX: II 3G Ex nA II T6; II 3G Ex ic IIC T6; II 3D Ex tc IIIC T80°C IP66		8															
Additional equipment																	
Inductive limit switch	Without		0														
	SJ2-SN (NC contact)		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			
Postioner compatible with paint														1			
Exhaust connection with ¼-18 NPT thread, back of positioner housing sealed			0	0		0		0						2			
Special version																	
None															0	0	0
NEPSI: Ex ia IIC T6		1													0	0	9
NEPSI: Ex nA II T6; Ex nL IIC T6		8													0	1	0
IECEx: Ex ia IIC T6-T4 Gb, Ex ia IIC T80°C Db		1													0	1	2
IECEx: Ex tb IIIC T6 T80°C Db		5													0	3	4
IECEx: Ex nA IIC T6-T4 Gc; Ex tc IIIC T80°C Dc		8													0	1	5
EAC Ex: 1Ex ia IIC T6; Ex tb IIIC T80°C Db X, IP66		1													0	1	4
EAC Ex: 2Ex nA ic IIC T6/T5/T4 Gc X; Ex tc IIIC T80°C Db X, IP66		8													0	2	0

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 booster is vented to the atmosphere. As a result, the actuator is vented and the valve moves to the fail-safe position.

NOTICE

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

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.

Note: *The TROVIS-VIEW software is a common operator interface for various smart SAMSON devices. The software together with a device-specific module allow the configuration and parameterization of the device. The device-specific module for Type 3730-4 can be downloaded free of charge from the SAMSON website (Services > Software > TROVIS-VIEW). Additional information on TROVIS-VIEW (e.g. system requirements) can found on the SAMSON website and in the Data Sheet T 6661.*

1.3 Technical data

Type 3730-4 Positioner (the listed technical data may be restricted by the limits specified in the test certificate for explosion-protected devices)	
Rated travel, adjustable	Direct attachment to Type 3277: 3.6 to 30 mm Attachment acc. to IEC 60534-6 (NAMUR): 3.6 to 300 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 in PROFIBUS-PA specification, acc. to IEC 61158 and IEC 61784
	Certified DTM acc. to FDT Specification 1.2 for integration of the device into suitable FDT framework applications · Other integrations, e.g. EDD in SIMATIC PDM
Local	Over SAMSON SSP interface and serial interface adapter
Software requirements	SAMSON TROVIS-VIEW with database module 3730-4
Perm. operating voltage	9 to 32 V DC, power supply over bus line The limits in test 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

Type 3730-4 Positioner (the listed technical data may be restricted by the limits specified in the test certificate for explosion-protected devices)	
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 To the actuator with air To the vent actuator	At Δp = 6 bar: ≥ 8.5 m_n^3/h, at Δp = 1.4 bar: 3.0 m_n^3/h $K_{Vmax\ (20\ °C)}$ = 0.09 at Δp = 6 bar: ≤ 14.0 m_n^3/h, at Δp = 1.4 bar: 4.5 m_n^3/h $K_{Vmax\ (20\ °C)}$ = 0.15
Permissible ambient temperature	–20 to +80 °C for all versions –45 to +80 °C with metal cable gland **The listed temperature limits may be restricted by the limits specified in the test certificate for explosion-protected devices.**
Influences – Temperature	≤ 0.15 %/10 K
Influences – Supply air	None
Influences – Vibration	≤ 0.25 % up to 2000 Hz and 4 g acc. to IEC 770
Electromagnetic compatibility	Complying with requirements of EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21
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
Use in safety-instrumented systems (SIL)	Observing the requirements of IEC 61508, the systematic capability of the pilot valve for emergency venting as a component in safety-instrumented systems is given.
	Use is possible on observing the requirements of IEC 61511 and the required hardware fault tolerance in safety-instrumented systems up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/HFT = 1).
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 1.4404/316L
Cable gland	Black polyamide, M20x1.5
Weight	Approx. 1.0 kg · Stainless steel version: 2.2 kg
Compliance	CE EAC

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 ≤ 12 V · Signal '1' safe pick-up >19 V
Service life	>5 x 10^6 switching cycles
K_V coefficient	0.15
Use in safety-instrumented systems (SIL)	Same as positioner pneumatics
Inductive limit switch	For connection to switching amplifier acc. to EN 60947-5-6
SJ2-SN proximity switch	Measuring plate not detected: ≥ 3 mA; Measuring plate detected: ≤ 1 mA
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	–40 to +90 °C with a fixed connection between positioner and position sensor
Vibration immunity	Up to 10 g in the range between 10 and 2000 Hz
Degree of protection	IP 67

Summary of explosion-protection certificates

Type 3730	Certification			Type of protection/comments
-4	**CCoE**	Number Date Valid until	A P HQ MH 104 1444 2018-04-21 2023-04-20	Ex ia IIC T6
-4	**STCC**	On request		
-41		Number Date	PTB 04 ATEX 2109 2017-05-11	II 2G Ex ia IIC T6 Gb; II 2D Ex ia IIIC T80°C Db
-41		Number Date Valid until	RU-C-DE. 08.B.00697 2014-12-15 2019-12-14	1Ex ia IIC T6; Ex tb IIIC T80°C Db X, IP66

Type 3730	Certification			Type of protection/comments
-41	**IECEx**	Number Date	PTB 06.0054 2017-07-17	Ex ia IIC T6-T4 Gb; Ex ia IIC T80°C Db
-41	**NEPSI**	Number Date Valid until	GYJ111267 2016-01-24 2023-01-23	Ex ia IIC T6
-43	**CSA**	Number Date	1675787 2017-05-24	Ex ia IIC T6, Class I, II, Div.1, Groups A-G; Ex nA II T6, Ex nL IIC T6; Class I, Div.2, Groups A-D; Class II, Div.1, Groups E-G
-43	**FM**	Number Date	3023605 2006-03-15	Class I, Zone 0 AEx ia IIC; Class I, II, III, Div.1, Groups A-G; Class I, Div.2, Groups A-D; Class II, Div.2, Groups F, G
-45		Number Date	PTB 04 ATEX 2109 2017-05-11	II 2D Ex tb IIIC T80°C Db
-45	**IECEx**	Number Date	PTB 06.0054 2017-07-17	Ex tb IIIC T80°C Db
-48		Number Date	PTB 05 ATEX 2010 X 2006-07-13	II 3G Ex nA IIC T6 Gc; II 3D Ex tc IIIC T80°C Dc
-48		Number Date Valid until	RU-C-DE. 08.B.00697 2014-12-15 2019-12-14	2Ex nA ic IIC T6/T5//TT4 Gc X; Ex tc IIIC T80°C Db X, IP66
-48	**IECEx**	Number Date	PTB 06.0054 2017-07-17	II nA Ex nA IIC T6-T4 Gc; Ex tc IIIC T80°C Dc
-48	**NEPSI**	Number Date Valid until	GYJ16.1082 2016-01-24 2021-01-23	Ex nA II T6; Ex nL IIC T6

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 6.

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.

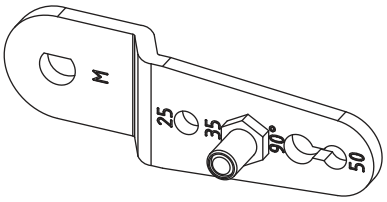


Fig. 3 · Lever M with pin position 35

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.*

The tables show the maximum adjustment range at the positioner. The travel that can

Travel table for direct attachment to Type 3277 Actuator

Type	Actuator size cm²	Rated travel mm	Adjustment range at positioner Min.	Travel	Max.	Required lever	Assigned pin position
Type 3277-5 and 3277 Actuators	120	7.5	5.0		25	M	25
	120/175/240/350	15	7.0		35.0	M	35
	355/700/750	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
	120/240/175/350	15	7.0		35.0	M	35
	355/700/750	7.5					
	355/700/750	15 and 30	10.0		50.0	M	50
	1000/1400/2800	30	14.0		70.0	L	70
	1000/1400/2800	60	20.0		100.0	L	100
	1400/2800	120	40.0		200.0	XL	200
See manufacturer's specifications		200	See manufacturer's specifications			XXL	300
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	Standard version for actuators up to 120 cm²		1400-7452
	Version compatible with paint for actuators up to 120 cm²		1402-0940
Accessories for the actuator	Switchover plate **old** for Actuator Type 3277-5xxxxxx.**00** (old)		1400-6819
	Switchover plate **new** for Actuator Type 3277-5xxxxxx.**01** (new)		1400-6822
	Connecting plate **new** for Actuator Type 3277-5xxxxxx.**01** (new) [1]: G ⅛ and ⅛ NPT		1400-6823
	Connecting plate **old** for Actuator Type 3277-5xxxxxx.**00** (old): G ⅛		1400-6820
	Connecting plate **old** for Actuator Type 3277-5xxxxxx.**00** (old): ⅛ NPT		1400-6821
	***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)	Stainless steel/Brass: 1402-0938 Stainless steel/St. steel: 1402-0939	

Table 2 · Direct attachment to Type 3277 (Fig. 5)					Order no.
Mounting parts	Standard version for actuators with 175, 240, 350, 355, 700, 750 cm²				1400-7453
	Version compatible with paint for actuators with 175, 240, 350, 355, 700, 750 cm²				1402-0941
Accessories	Required piping with screw fitting – for "Actuator stem retracts" – with air purging of the top diaphragm chamber	175 cm²	Steel	G ¼ / G ⅜	1402-0970
				¼ NPT / ⅜ NPT	1402-0976
			Stainl. steel	G ¼ / G ⅜	1402-0971
				¼ NPT / ⅜ NPT	1402-0978
		240 cm²	Steel	G ¼ / G ⅜	1400-6444
				¼ NPT / ⅜ NPT	1402-0911
			Stainl. steel	G ¼ / G ⅜	1400-6445
				¼ NPT / ⅜ NPT	1402-0912
		350 cm²	Steel	G ¼ / G ⅜	1400-6446
				¼ NPT / ⅜ NPT	1402-0913
			Stainl. steel	G ¼ / G ⅜	1400-6447
				¼ NPT / ⅜ NPT	1402-0914
		355 cm²	Steel	G ¼ / G ⅜	1402-0972
				¼ NPT / ⅜ NPT	1402-0979
			Stainl. steel	G ¼ / G ⅜	1402-0973
				¼ NPT / ⅜ NPT	1402-0980
		700 cm²	Steel	G ¼ / G ⅜	1400-6448
				¼ NPT / ⅜ NPT	1402-0915
			Stainl. steel	G ¼ / G ⅜	1400-6449
				¼ NPT / ⅜ NPT	1402-0916
		750 cm²	Steel	G ¼ / G ⅜	1402-0974
				¼ NPT / ⅜ NPT	1402-0981
			Stainl. steel	G ¼ / G ⅜	1402-0975
				¼ NPT / ⅜ NPT	1402-0982
	Connection block with seals and screw			G ¼	1400-8819
				¼ NPT	1400-8820
	Pressure gauge mounting kit (8) up to max. 6 bar (output/supply)			Steel/brass	1402-0938
				St. steel/st. steel	1402-0939

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. 17	1400-7457
5 to 50	Without (Lever M is mounted on basic model)	Actuators from other manufacturers and Type 3271 with 120 to 750 cm²	1400-7454
14 to 100	L	Actuators from other manufacturers and Type 3271, versions 1000 and 1400-60	1400-7455
40 to 200	XL	Actuators from other manufacturers and Type 3271, versions 1400-120 and 2800 cm² with 120 mm travel	1400-7456
30 or 60	L	Type 3271, version 1400-120 and 2800 cm² with 30/60 mm travel In conjunction with Type 3273 Side-mounted Handwheel with 120 mm rated travel, additionally one bracket (0300-1162) and two countersunk screws (8330-0919) are required.	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. steel/brass: 1402-0938 St. steel/st. steel: 1402-0939	

Table 4 · Attachment according to VDI/VDE 3847 (Figs. 7 and 9) **Type 3730-4xxxxxxxx0x0070xx** Electropneumatic Positioner with VDI/VDE 3847 interface				Order no.
Mounting parts	Interface adapter			1402-0257
	Mounting kit for attachment to SAMSON Type 3277 with 175 to 750 cm²			1402-0868
	Mounting kit for attachment to SAMSON Type 3271 or non-SAMSON actuators			1402-0869
	Connecting plate, including connection for air purging of actuator spring chamber	Aluminum	ISO 228/1-G ¼	1402-0268
			¼-18 NPT	1402-0269
		Stainless steel	ISO 228/1-G ¼	1402-0270
			¼-18 NPT	1402-0271
	Travel pick-off for valve travel up to 100 mm			1402-0177
	Travel pick-off for 100 to 200 mm valve travel (SAMSON Type 3271 only)			1402-0178

Table 5 · Attachment according to VDI/VDE 3847-2 (Fig. 12 and 14)		Order no.
Mounting parts	Mounting block for PFEIFFER Type 31a (edition 2020+) Rotary Actuators with dummy plate for solenoid valve interface	1402-1645
	Dummy plate for solenoid valve interface (sold individually)	1402-1290
	Adapter bracket for Type 3730 (VDI/VDE 3847)	1402-0257
	Adapter bracket for Type 3730 and Type 3710 (DAP/PST)	1402-1590
Accessories for actuator	Shaft adapter AA1	1402-1617
	Shaft adapter AA2	1402-1616
	Shaft adapter AA3	1402-1888

Table 6 · Attachment to rotary actuators (Fig. 19)			
Mounting parts	Attachment according to VDI/VDE 3845 (September 2010), actuator surface corresponds to fixing level 1. See section 16.1.		
	Size AA1 to AA4, version with CrNiMo steel bracket		1400-7448
	Size AA1 to AA4, heavy-duty version		1400-9244
	Size AA5, heavy-duty version (e.g. Air Torque 10 00)		1400-9542
	Bracket surface corresponds to fixing level 2, heavy-duty version		1400-9526
	Attachment for rotary actuators up to 180° opening angle, fixing level 2		1400-8815 and 1400-9837
	Attachment for SAMSON Type 3278 with 160/320 cm², CrNiMo steel bracket		1400-7614
	Attachment for Camflex II		1400-9120
	SAMSON Type 3278 with 160 cm² and VETEC Types S160, R and M, heavy-duty version		1400-9245
	SAMSON Type 3278 with 320 cm² and for VETEC Type S320, heavy-duty version		1400-5891 and 1400-9526
Accessories	Connecting plate (6)	G ¼	1400-7461
		¼ NPT	1400-7462
	Pressure gauge bracket (7)	G ¼	1400-7458
		¼ NPT	1400-7459
	Pressure gauge mounting kit up to max. 6 bar (output/supply)	St. steel/brass	1402-0938
		St. steel/st. steel	1402-0939

Table 7 · General accessories				
Accessories	Pneumatic reversing amplifier for double-acting actuators			Type 3710
	Cable gland M20 x 1.5	Black plastic (6 to 12 mm clamping range)		8808-1011
		Blue plastic (6 to 12 mm clamping range)		8808-1012
		Nickel-plated brass (6 to 12 mm clamping range)		1890-4875
		Nickel-plated brass (10 to 14 mm clamping range)		1922-8395
		Stainless steel 1.4305 (8 to 14.5 mm clamping range)		8808-0160
		EMC cable gland M20 x 1.5		8808-0143
	Adapter M20 x 1.5 to ½ NPT	Aluminum, powder paint coated		0310-2149
		Stainless steel		1400-7114
	Retrofit kit for inductive limit switch 1x SJ 2-SN			1402-1770
	Cover plate with list of parameters and operating instructions		German/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			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) including TROVIS-VIEW CD-ROM			1400-9740
	PROFIBUS round connector M12x1			1992-0202

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 screw plug (4) on the back of the positioner and close the signal pressure output "Output 38" on the connecting plate (6) or on the pressure gauge bracket (7) with the stopper (5) included in the accessories.
3. Place follower clamp (3) on the actuator stem, align and screw tight so that the mounting screw is located in the groove of the actuator stem.
4. Mount cover plate (10) with narrow side of the cut-out opening (Fig. 4, left) pointing towards the signal pressure 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) into the groove of the positioner housing and the seal ring (10.1) on the back of the housing.
7. Place positioner on the cover plate (10) in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or the switch (Fig. 30).
   The lever (1) must rest on the follower clamp with spring force.
   Mount the positioner on the cover plate (10) using the two fixing screws.

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

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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.

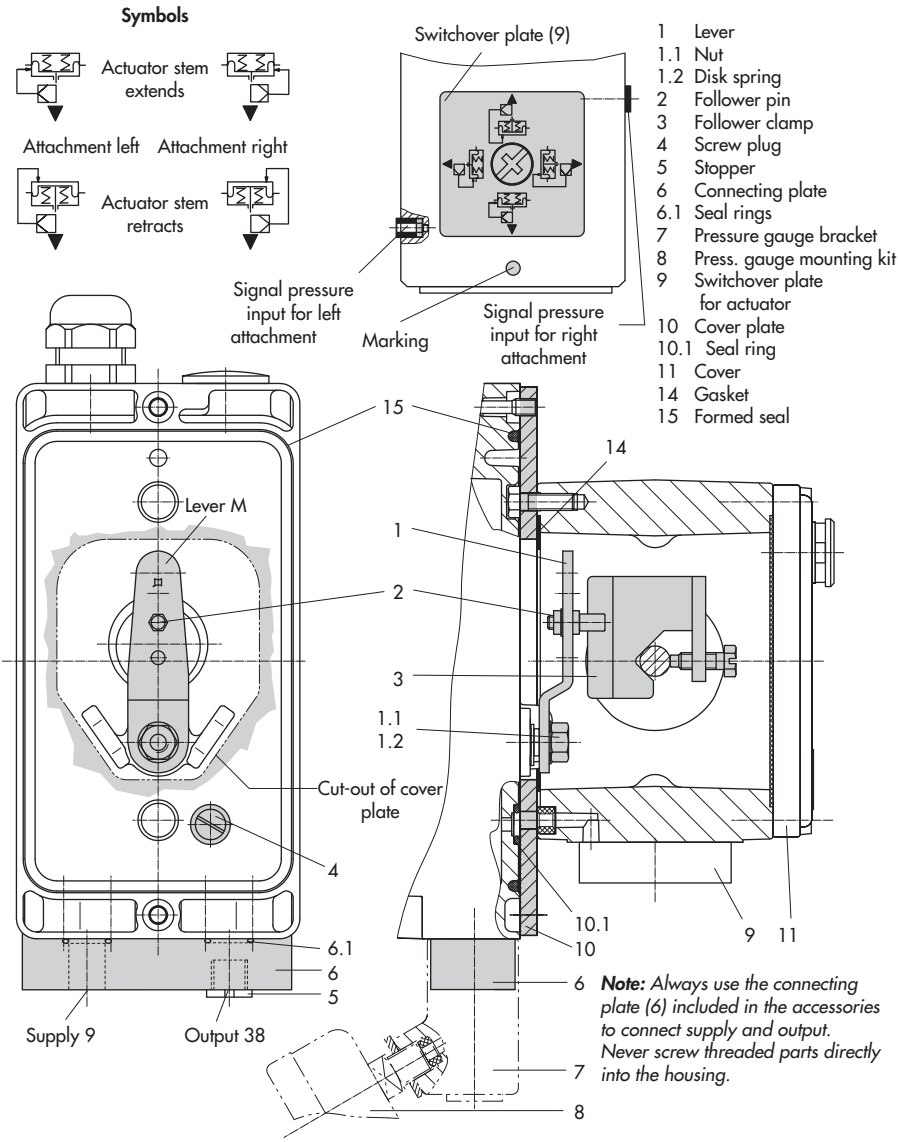

Fig. 4 · Direct attachment - Signal pressure connection for Type 3277-5 Actuator with 120 cm²

2.1.2 Type 3277 Actuator

Refer to Table 2 on page 17 or the required mounting parts as well as the accessories with their order numbers.
Note the travel table on page 15.

Actuators with 175 to 750 cm²

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

1. Place follower clamp (3) on the actuator stem, align and screw tight so that the mounting screw is located in the groove of the actuator stem.
2. Mount cover plate (10) with narrow side of the cut-out opening (Fig. 5, on the left) pointing towards the signal pressure connection. Make sure that the bonded gasket (14) points towards the actuator yoke.
3. For actuators with 355, 700 or 750 cm², remove the follower pin (2) at lever **M** (1) on the back of the positioner from pin position **35**, reposition it in the bore for pin position **50** and screw tight. For actuators 175 to 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. 30). 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.

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

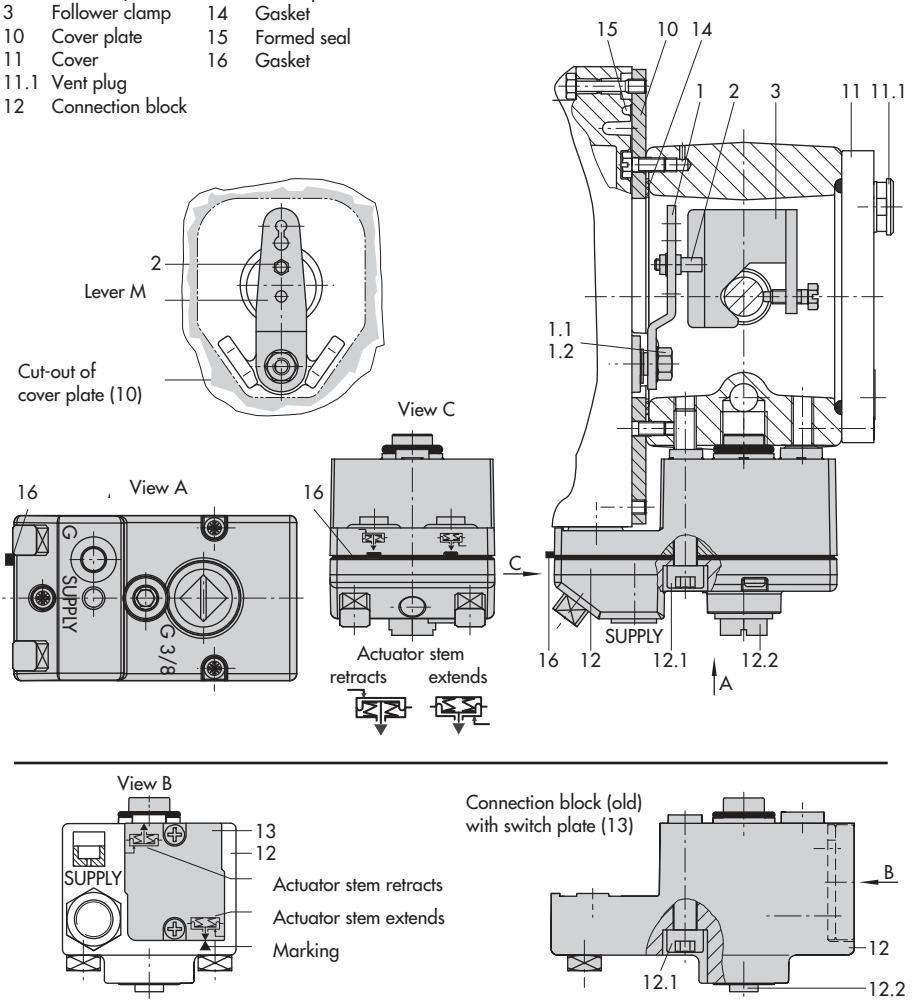

Fig. 5 · Direct attachment – Signal pressure connection for Type 3277 Actuator with 175 to 750 cm²

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 18 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.*

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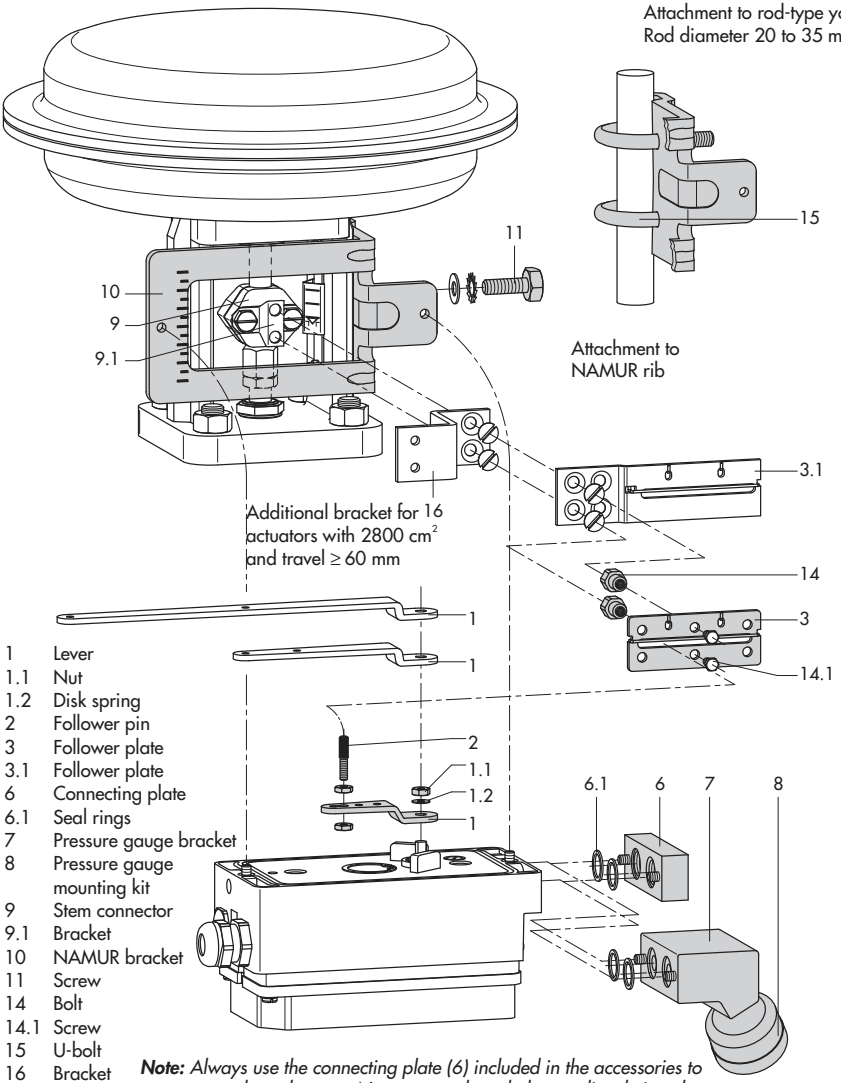
7. Place positioner on the NAMUR bracket in such a manner that the follower pin (2) rests in the slot of the follower plate (3, 3.1). Adjust the lever (1) correspondingly.
   Screw the positioner to the NAMUR bracket using both its fixing screws.



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

2.3 Attachment according to VDI/VDE 3847-1

Type 3730-4xxxxxxxx0x00**6**0xx and Type 3730-4xxxxxxxx0x00**7**0xx Positioners with optional air purging of the actuator's spring chamber can be attached according to VDI/VDE 3847.

Type 3730-4xxxxxxxx0x00**0**0xx Positioner without optional air purging of the actuator's spring chamber can be attached according to VDI/VDE 3847.

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

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

Attachment to Type 3277 Actuator (see Fig. 7)

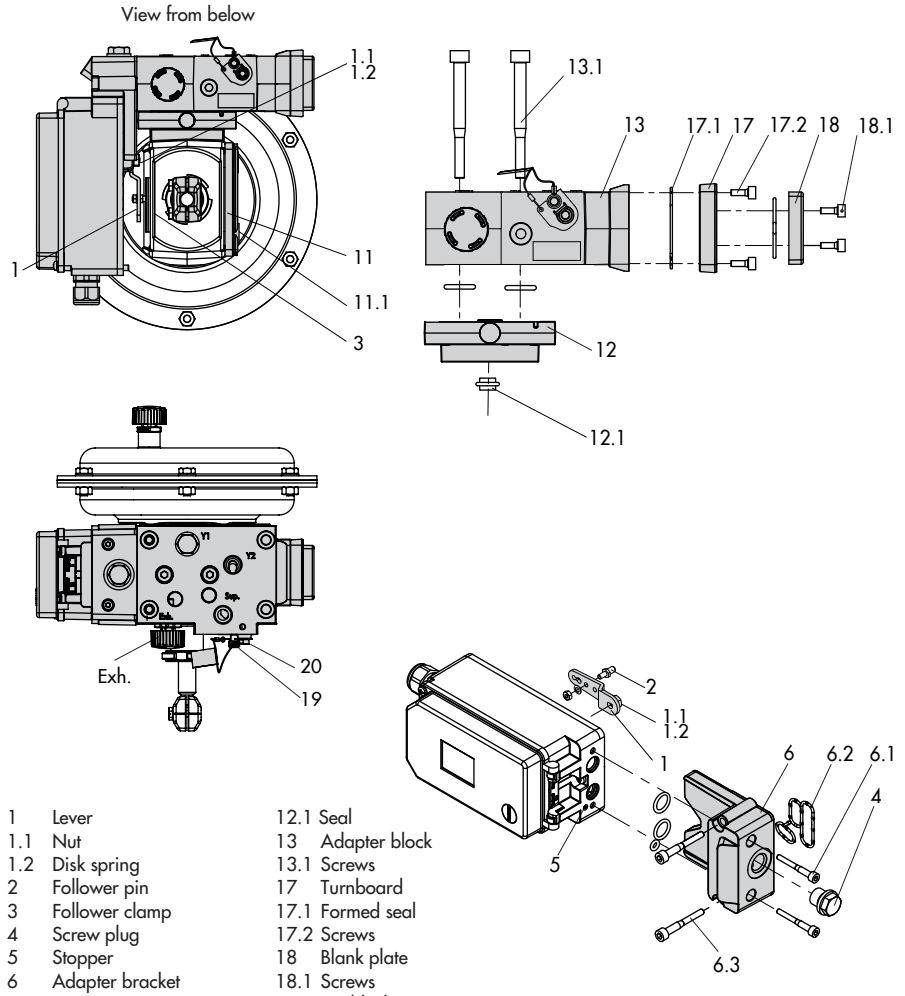
Refer to Table 4 on page 18 for the required mounting parts as well as the accessories.

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

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

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

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



1 Lever
1.1 Nut
1.2 Disk spring
2 Follower pin
3 Follower clamp
4 Screw plug
5 Stopper
6 Adapter bracket
6.1 Screws
6.2 Formed seal
6.3 Screws
11 Cover
11.1 Vent plug
12 Connecting plate
12.1 Seal
13 Adapter block
13.1 Screws
17 Turnboard
17.1 Formed seal
17.2 Screws
18 Blank plate
18.1 Screws
19 Air blocker
20 Retaining screw

Fig. 7 · Attachment according to VDI/VDE 3847 onto Type 3277 Actuator

7. Insert screws (13.1) through the middle holes of the adapter block (13).
8. Place the connecting plate (12) together with the seal (12.1) onto the screws (13.1) corresponding to the fail-safe action "actuator stem extends" or "actuator stem retracts".
   The fail-safe action that applies is determined by aligning the groove of the adapter block (13) with the groove of the connecting plate (12) (Fig. 8).
9. Mount the adapter block (13) together with the connecting plate (12) to the actuator using the screws (13.1).
10. Insert the vent plug (11.1) to the **Exh.** connection.
11. For fail-safe action "actuator stem extends", seal the Y1 port with a blanking plug.
    For fail-safe action "actuator stem retracts", connect the Y1 port to the signal pressure connection of the actuator.

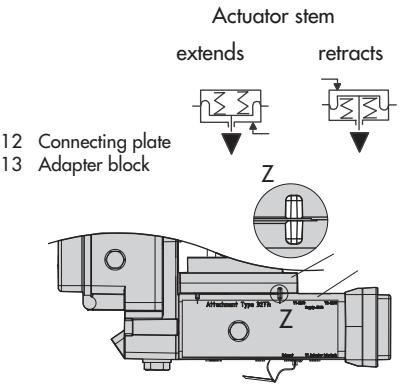


Fig. 8 · Fail-safe action

12. Place the positioner on the adapter block (13) in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or the switch (Fig. 30). The lever (1) must rest on the follower clamp with spring force.
    Fasten the positioner to the adapter block (13) using the two fixing screws (6.3). Make sure the formed seal (6.2) is properly seated.
13. Mount cover (11) on the other side. Make sure that the vent plug points downwards when the control valve is installed to allow any condensed water that collects to drain off.

Attachment to NAMUR rib (see Fig. 9)

Refer to Table 4 on page 18 for the required mounting parts as well as the accessories. Note the travel table on page 15.

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

   Type 3251 Valve, 350 to 2800 cm²: Screw the longer follower plate (3.1) to the bracket of the stem connector or directly to the stem connector (depending on the version).

   Type 3254 Valve, 1400-120 to 2800 cm²: Screw the two bolts (14) to the bracket (16). Fasten the bracket (16) onto the stem connector, place the follower plate (3) on top and use the screws (14.1) to fasten it.

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

2. For **attachment to the NAMUR rib**, fasten the NAMUR connection block (10) directly into the existing yoke bore using the screw and toothed lock washer (11). Align the marking on the NAMUR valve connection (on the side marked '1') to 50 % travel.
   For **attachment to valves with rod-type yokes**, use two U-bolts (15) around the stem.
   Fasten the NAMUR connection block (10) directly into the existing yoke bore using the screw and toothed lock washer (11). Align the marking on the NAMUR connection block (on the side marked '1') to 50 % travel.
3. Place the adapter bracket (6) on the positioner and mount using the screws (6.1). Make sure that the seals are correctly seated. For positioners **with air purging**, remove the stopper (5) before mounting the positioner.
   For positioners **without air purging**, replace the screw plug (4) with a vent plug.
4. Select required lever size (1) **M**, **L** or **XL** and pin position according to the actuator size and valve travels listed in the table on page 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:

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

5. Insert formed seal (6.2) in the groove of the adapter bracket.
6. Insert the formed seal (17.1) into the turnboard (17) and mount the turnboard to the adapter block (13) using the screws (17.2).

7. Mount the blank plate (18) to the turnboard (17) using the screws (18.1) Make sure that the seals are correctly seated.

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

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

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

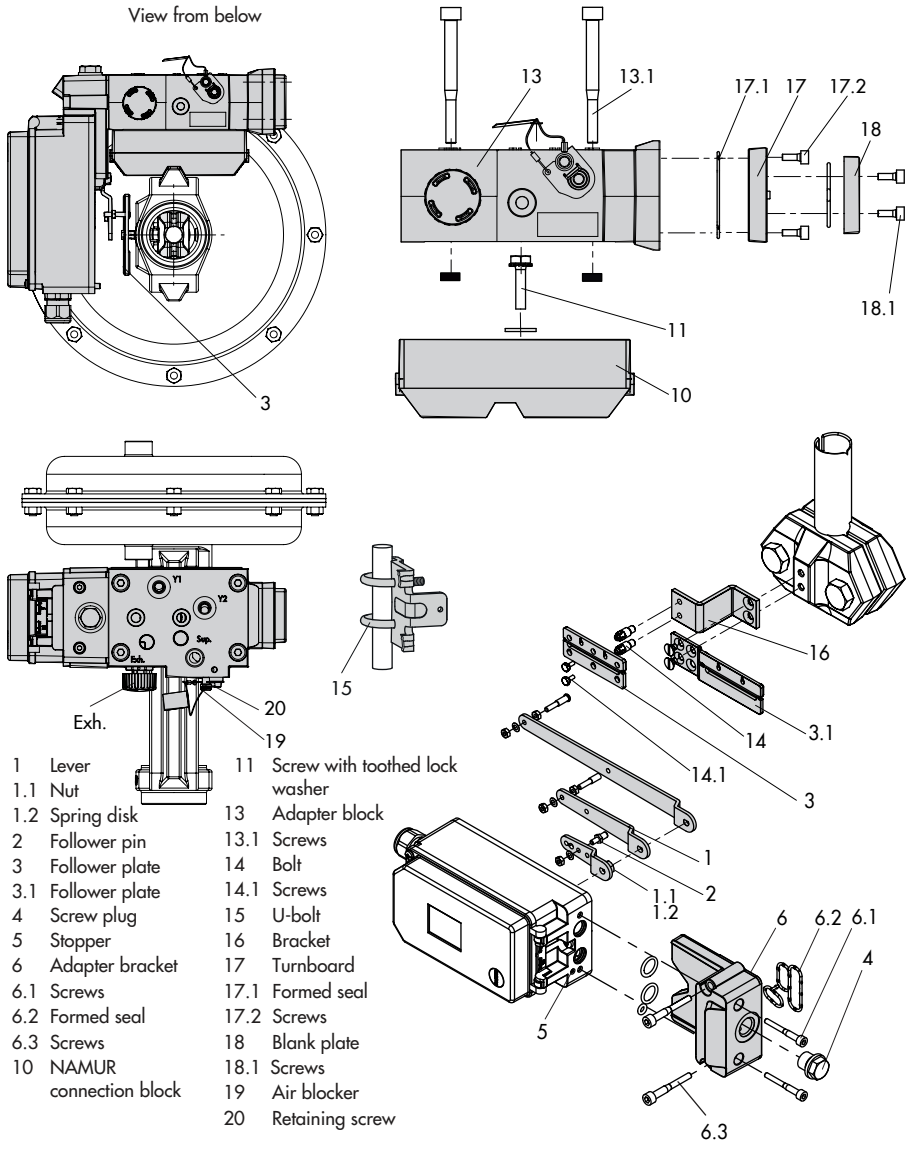
2.4 Attachment according to VDI/VDE 3847-2

Attachment according to VDI/VDE 3847-2 for PFEIFFER SRP (single-acting) and DAP (double-acting) rotary actuators in sizes 60 to 1200 with NAMUR interface and air purging of the actuator's spring chamber allows the direct attachment of the positioner without additional piping.

Additionally, the positioner can be replaced quickly while the process is running by blocking the air in single-acting actuators.

Procedure to block the actuator in place (see Fig. 10):

1. Unscrew the red retaining screw (1).
2. Turn the air blocker (2) on the bottom of the adapter block according to the inscription.



1 Lever
1.1 Nut
1.2 Spring disk
2 Follower pin
3 Follower plate
3.1 Follower plate
4 Screw plug
5 Stopper
6 Adapter bracket
6.1 Screws
6.2 Formed seal
6.3 Screws
10 NAMUR connection block
11 Screw with toothed lock washer
13 Adapter block
13.1 Screws
14 Bolt
14.1 Screws
15 U-bolt
16 Bracket
17 Turnboard
17.1 Formed seal
17.2 Screws
18 Blank plate
18.1 Screws
19 Air blocker
20 Retaining screw

Fig. 9 · Attachment according to VDI/VDE 3847-1 to the NAMUR rib

2.4.1 Version for single-acting actuator

Mounting onto a PFEIFFER Type 31a (edition 2020+) SRP Rotary Actuator Refer to Fig. 12.

1. Fasten the adapter block (1) to the actuator's NAMUR interface using the four fastening screws (2).
   Make sure that the seals are correctly seated.
2. Mount the follower wheel (3) onto the actuator shaft. Use the matching shaft adapter (see Table 5 on page 19).
3. Place the adapter bracket (4) onto the adapter block (1) and fasten it using the fastening screws (5). Make sure that the seals are correctly seated.
4. Insert and fasten the follower pin in the 90° position on the positioner's lever (see Fig.11). Only use the longer follower pin included in the mounting kit.
5. Align the positioner on the adapter bracket (1) in such a way that the follower pin engages into the actuator's follower wheel (3).
6. Fasten the positioner onto the adapter bracket (4) using the fastening screws (6). Make sure that the seals are correctly seated.

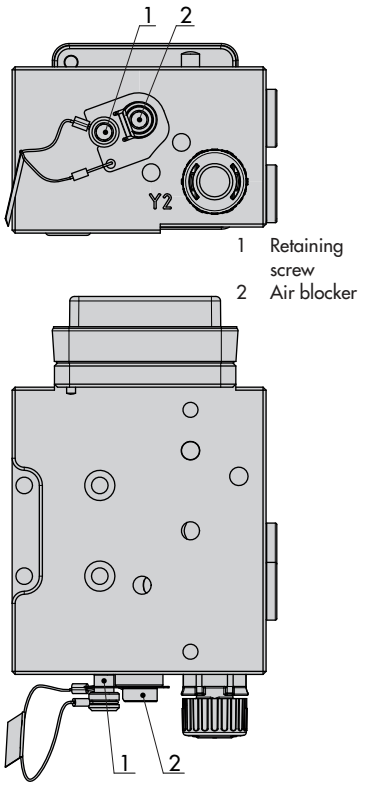


Fig. 10 · Adapter block for attachment according to VDI/VDE 3847-2

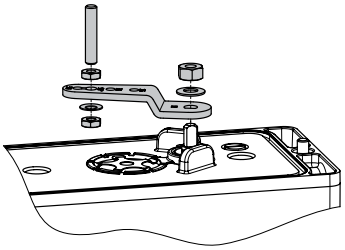


Fig. 11 · Follower pin in 90° position

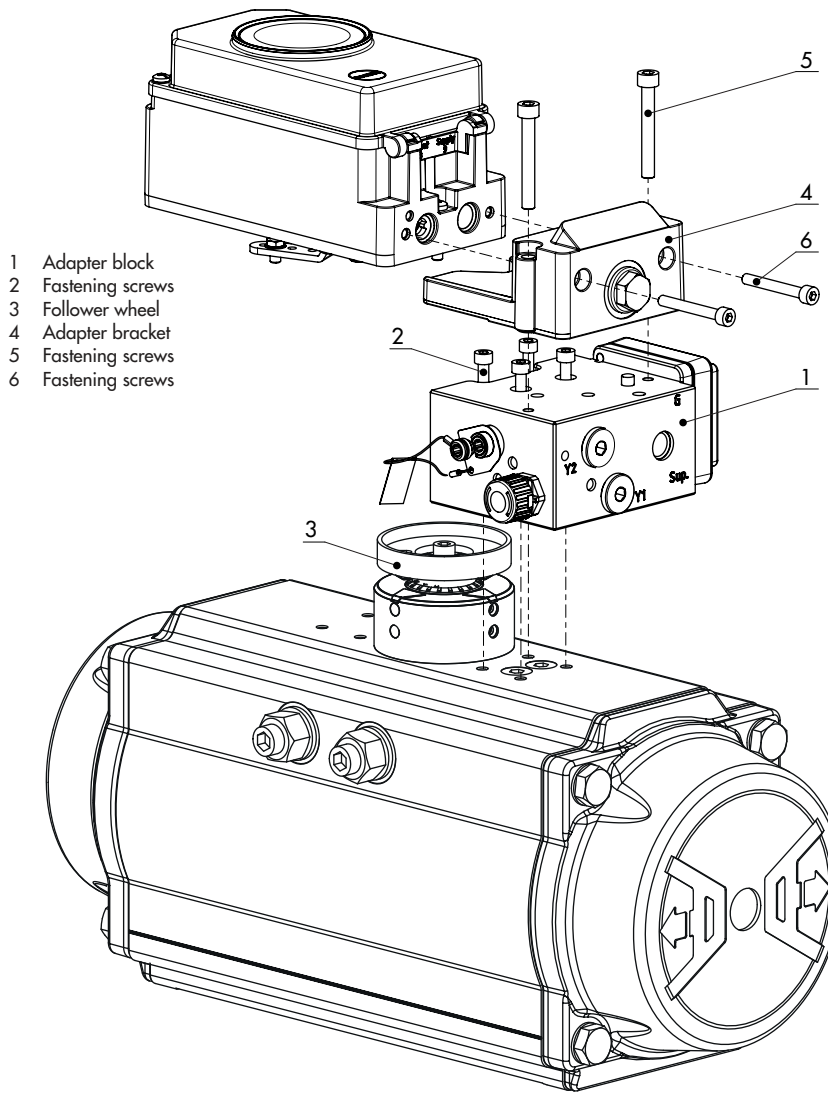


Fig. 12 · Mounting on a single-acting actuator

2.5 Version for double-acting actuator

A reversing amplifier must be additionally mounted for applications with double-acting (DAP) actuators or applications with single-acting (SAP) actuators that include partial stroke testing.

In this case, a special adapter bracket (4) is required for mounting. Refer to Fig. 14.

1. Fasten the adapter block (1) to the actuator's NAMUR interface using the four fastening screws (2). Make sure that the seals are correctly seated.
2. Mount the follower wheel (3) onto the actuator shaft. Use the matching adapter (see Table 5 on page 19).
3. Place the adapter bracket (4) onto the adapter block (1) and fasten it using the fastening screws (5). Make sure that the seals are correctly seated.
4. Insert and fasten the follower pin into the 90° position on the positioner's lever (see Fig. 11).
5. Align the positioner on the adapter bracket (1) in such a way that the follower pin engages into the actuator's follower wheel (3).
6. Fasten the positioner onto the adapter bracket (4) using the fastening screws (6).
7. Mount the Type 3710 Reversing Amplifier (7) together with the two guide bushings (8) and terminal plate (9) onto the adapter bracket using the associated fastening screws (10).

   Make sure that the seals are correctly seated.
8. Remove the vent plug at the adapter block and seal the opening with the G ¼ screw plug.
9. Mount the turnboard marked 'Doppel' for double-acting actuators or the turn-board marked 'PST' for single-acting actuators with partial stroke testing. See Fig. 13.

Make sure that the seals are correctly seated.

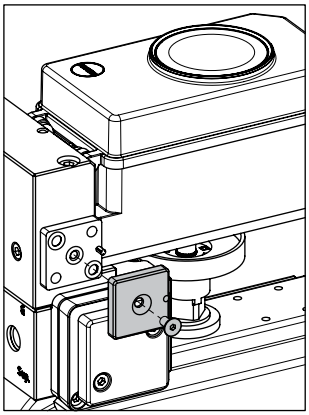


Fig. 13 · Mounting the turnboard

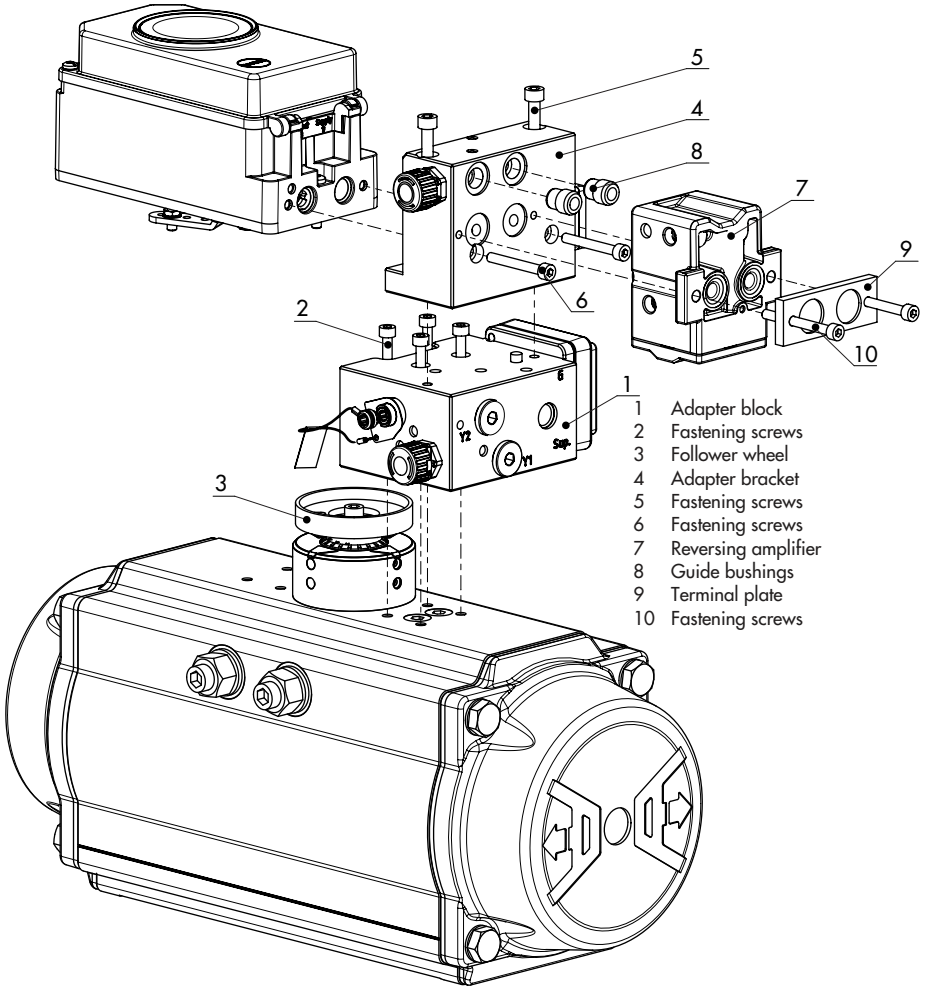


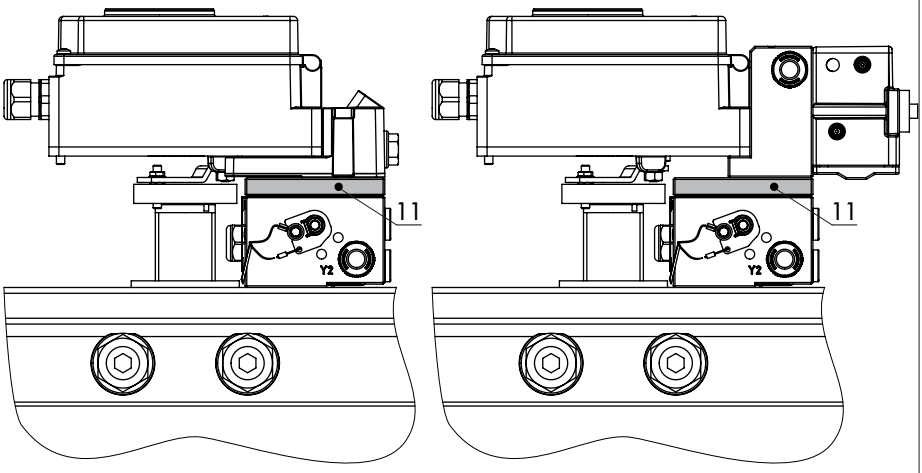
Fig. 14 · Mounting on a double-acting actuator or single-acting actuator with partial stroke testing

Intermediate plate for AA4 interface (Fig. 15)

An intermediate plate (1) must be mounted between the adapter block and adapter bracket for PFEIFFER SRP and DAP rotary actuators in sizes 900 and 1200 with AA4 interface. This plate is included in the accessories for the shaft adapter AA4 (see Table 5).

Mounting a solenoid valve (Fig. 16)

A solenoid valve can also be mounted in place of the blank plate (18). The orientation of the turnboard (17) determines the mounting position of the solenoid valve. Alternatively, a restrictor plate can be mounted. Further information can be found in the document AB 11 (Accessories for Solenoid Valves).



11 Intermediate plate

Fig.15 · Intermediate plate for actuators in sizes 900 and 1200 for AA4 interface

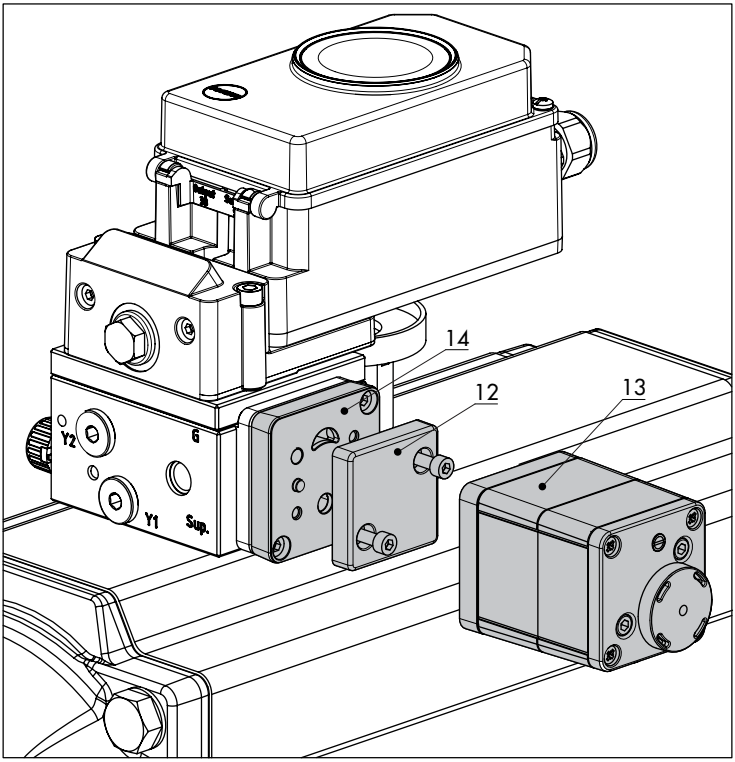


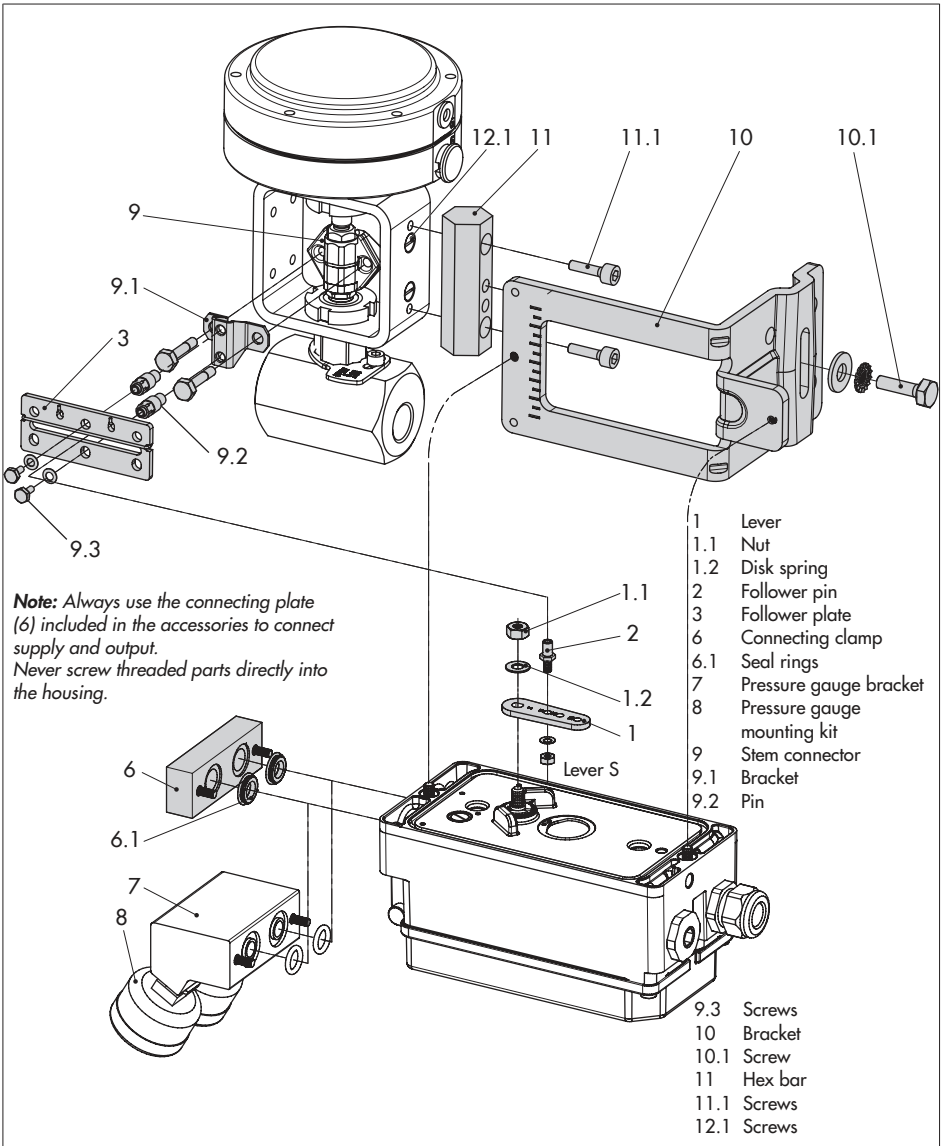
Fig. 16 · Mounting a solenoid valve

2.6 Attachment to Type 3510 Micro-flow Valve

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

Refer to Table 3 on page 18 for the required mounting parts as well as the accessories with their order numbers.
Note the travel table on page 15.

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



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. 17 · Attachment to Type 3510 Micro-flow Valve

2.7 Attachment to rotary actuators

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

Refer to Table 6 on page 19 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. 19 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 2.8.
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. 19). 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.

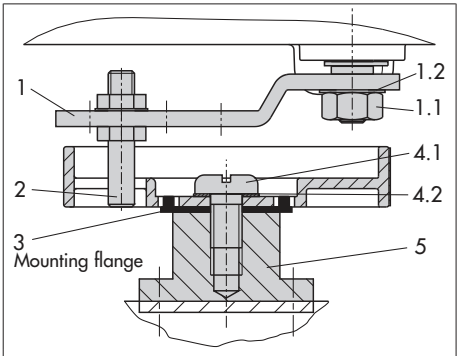
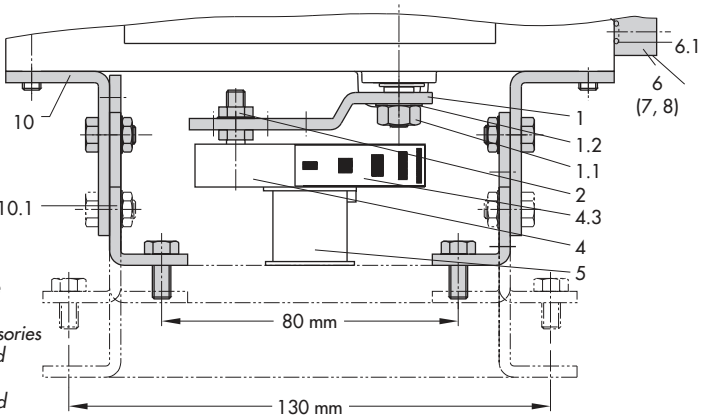
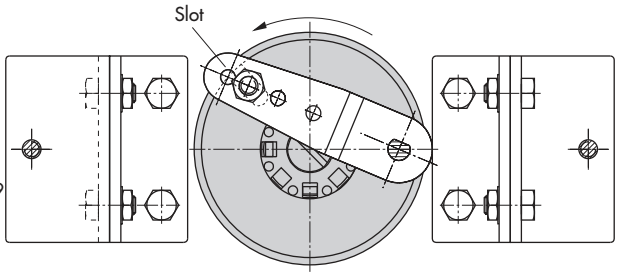


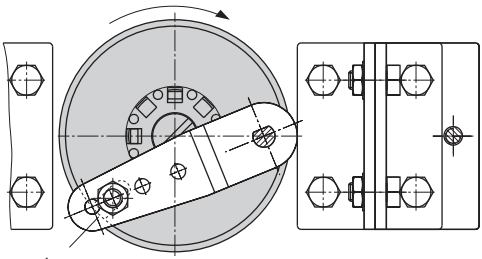
Fig. 18 · Mounting the coupling wheel with Type 3278



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



Control valve opens clockwise



Legends Figs. 18 + 19

1	Lever
1.1	Nut
1.2	Disk spring
2	Follower pin
3	Follower clamp (Fig. 11)
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. 19 · Attachment to rotary actuators

2.7.1 Heavy-duty version

Refer to Table 6 on page 19 for the required mounting parts as well as the accessories with their order numbers.

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

1. Mount the housing (10) onto the rotary actuator. In case of VDI/VDE attachment, place spacers (11) underneath, if necessary.
2. **For SAMSON Type 3278 and VETEC S160 Rotary Actuator**, screw the adapter (5) onto the free end of the shaft or place adapter (5.1) onto the shaft of the **VETEC R Actuator.**
   Place adapter (3) onto **Type 3278, VETEC S160 and VETEC R Actuator**. For **VDI/VDE version**, this step depends on the actuator size.
3. Stick adhesive label (4.3) onto the coupling wheel in such a manner that the yellow part of the sticker is visible in the window of the housing when the valve is OPEN. Adhesive labels with explanatory symbols are enclosed and can be stuck on the housing, if required.
4. Screw tight coupling wheel (4) onto the slotted actuator shaft or adapter (3) using screw (4.1) and disk spring (4.2).
5. Undo the standard follower pin (2) on the lever M (1) of the positioner. Attach the follower pin (Ø 5) included in the mounting kit to pin position 90°.
6. If applicable, mount pressure gauge bracket (7) with pressure gauges or, in case G ¼ threaded connections are required, the connecting plate (6), making sure both seal rings (6.1) are seated properly.
   For double-acting, springless rotary actuators, a reversing amplifier is required to attach the positioner to the actuator. Refer to section 2.8.
7. For actuators with a volume of less than 300 cm³, fit the screw-in restriction (order no.1400-6964) into the signal pressure output of the positioner (or the output of the pressure gauge bracket or connecting plate).
8. Place positioner on housing (10) and screw it tight. Considering the actuator's direction of rotation, align lever (1) so that it engages in the correct slot of the coupling wheel with its follower pin (Fig. 20).

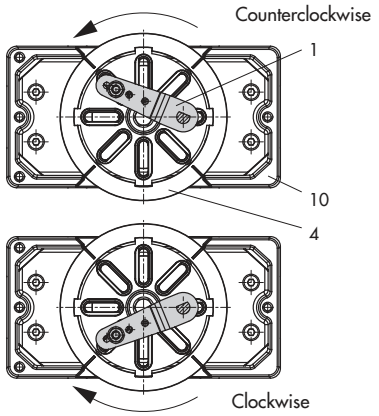


Fig. 20 · Direction of rotation

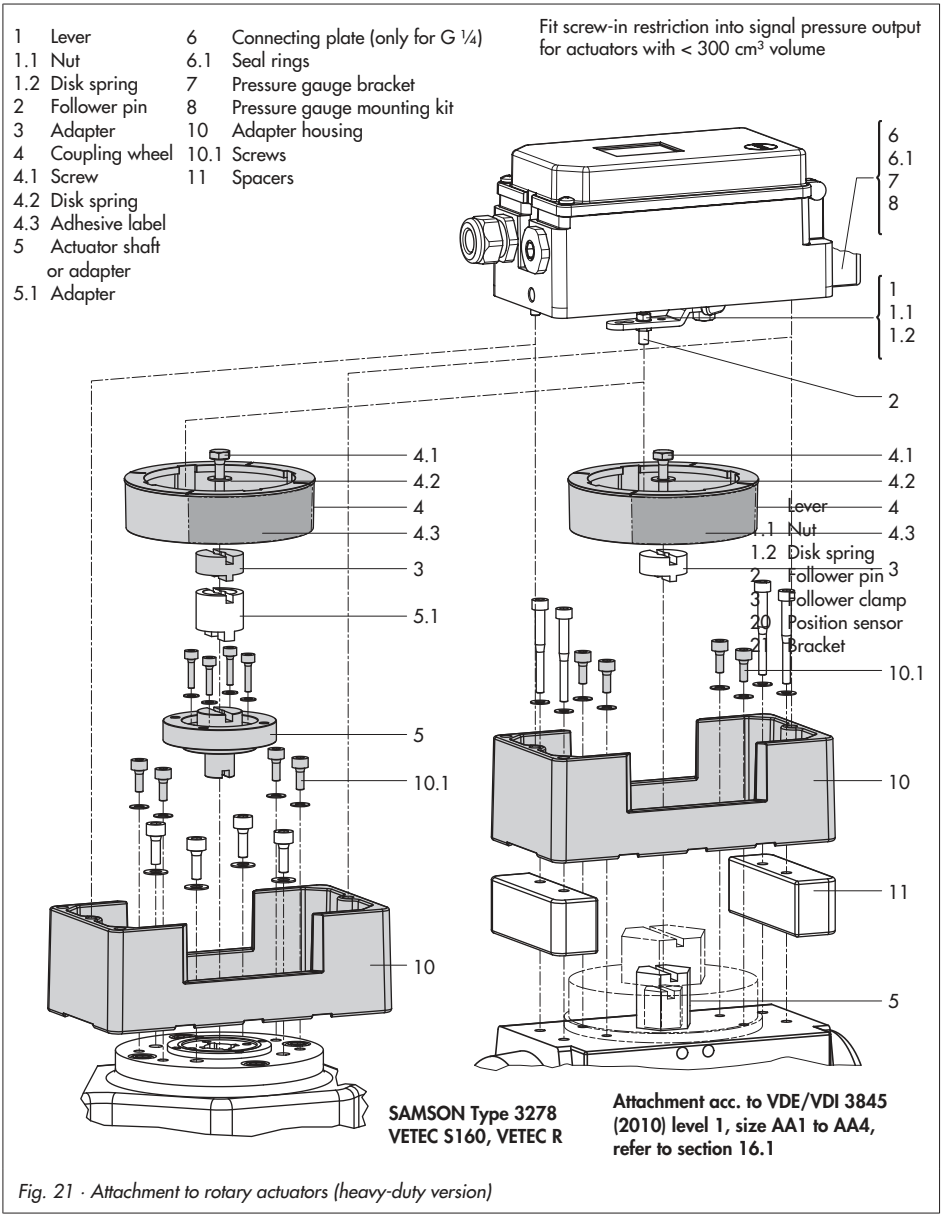


Fig. 21 · Attachment to rotary actuators (heavy-duty version)

2.8 Reversing amplifier for double-acting actuators

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

If a different reversing amplifier (item no. 1079-1118 or 1079-1119) is used, follow the mounting instructions described in section 2.8.1.

The following applies to all reversing amplifiers:

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

$\mathbf{A_1}$: Output $\mathbf{A_1}$ leading to the signal pressure connection at the actuator which opens the valve when the pressure increases

$\mathbf{A_2}$: Output $\mathbf{A_2}$ 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**.

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

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 $\mathbf{A_1}$ 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 $\mathbf{A_1}$ and **Z**.

NOTICE
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.

---

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

Pressure gauge attachment

The mounting sequence shown in Fig. 22 remains unchanged. Screw a pressure gauge bracket onto the connections $\mathbf{A_1}$ 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 5.

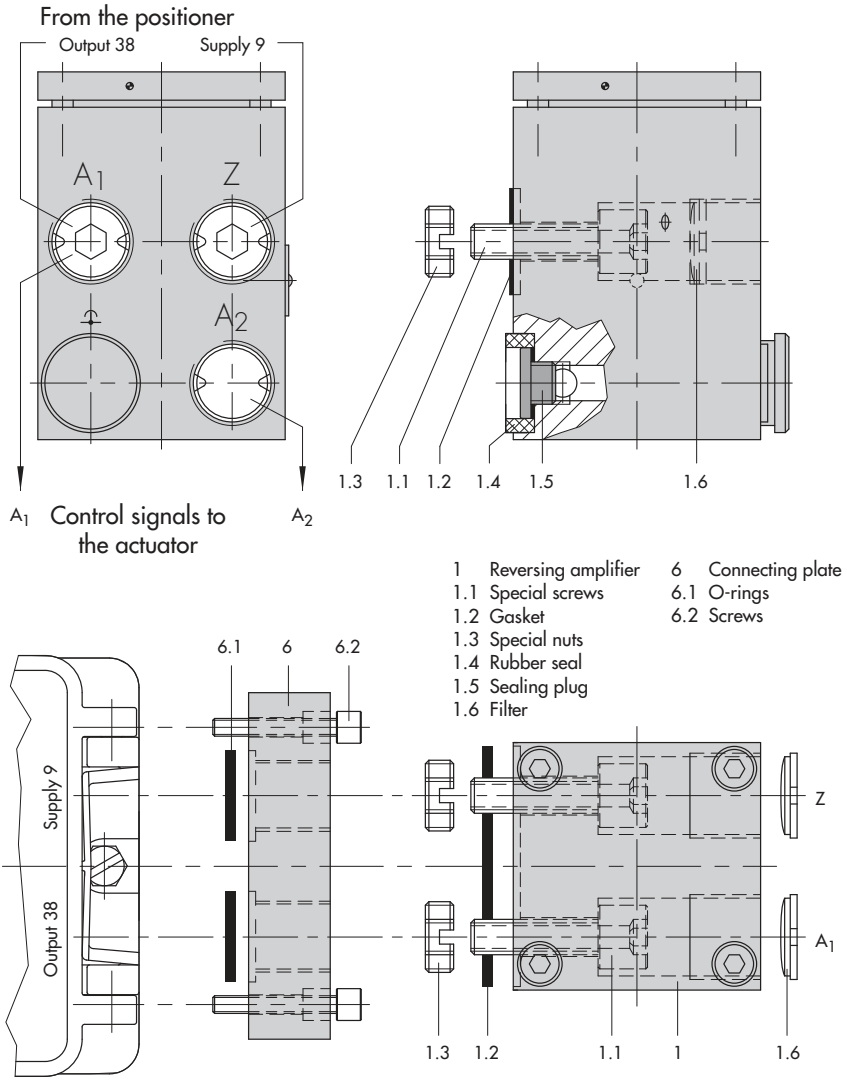


Fig. 22 · Mounting a reversing amplifier (1079-1118 or 1079-1119)

2.9 Attaching an external position sensor

Refer to Table 7 on page 54 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 8.

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

Fig. 23 · Positioner unit with sensor mounted on a micro-flow valve

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

For the electrical connection a 10 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.
- *Since 2009, the back of the position sensor (20) is fitted with two pins acting as mechanical stops for the lever (1). If this position sensor is mounted using old mounting parts, two corresponding Ø 8 mm holes must be drilled into the mounting plate/bracket (21). A template is available for this purpose. Refer to Table 7 on page 54.*

2.9.1 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. 24 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. 24, below).
- Make sure that the gasket for the connecting plate (9) is correctly inserted.
- The connecting plate has boreholes with NPT and G threads. Seal the threaded connection that is not used with the rubber seal and square plug.

Type 3277 Actuator with 175 to 750 cm²:

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

Mounting the position sensor

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 bore-

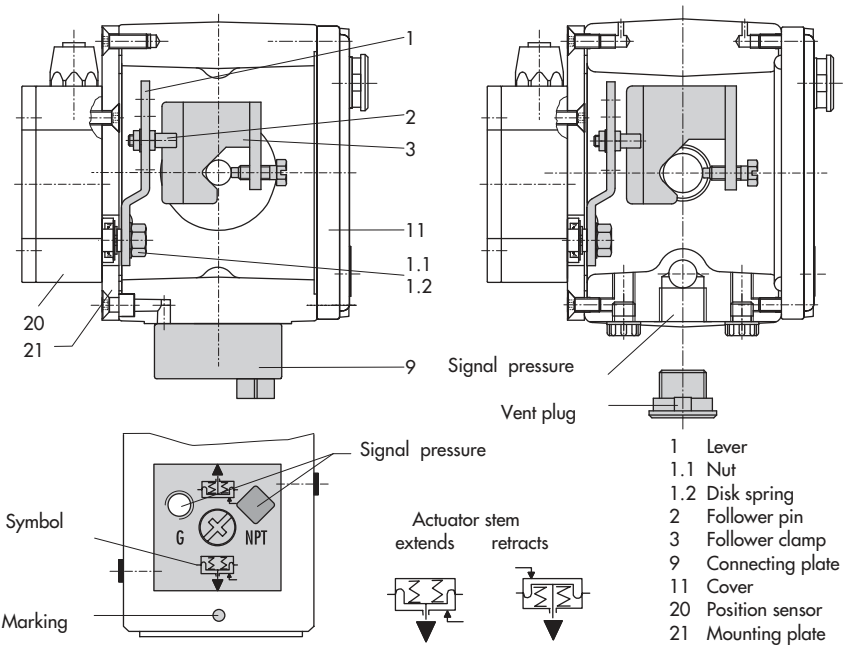


Fig. 24 · Mounting for Type 3277-5 Actuator (left) and Type 3277 Actuator (right)

hole for the recommended pin position and screw tight.

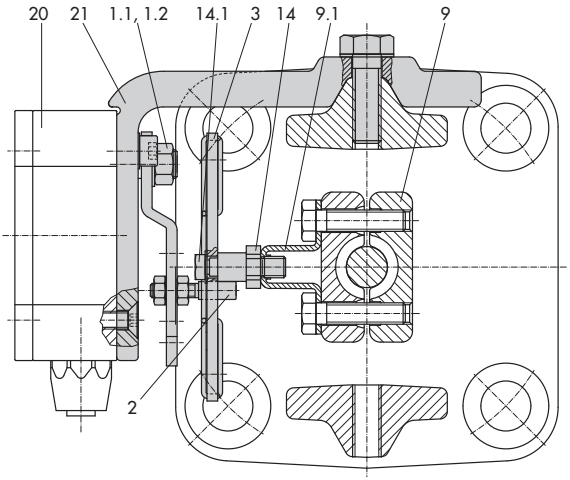
4. Place the lever (1) and disk spring (1.2) on the sensor shaft.
   Place the lever (1) **in mid-position** and **hold it in place**. Screw on the nut (1.1).
5. Place the follower clamp (3) on the actuator stem, align and fasten it, making sure that the fastening screw rests in the groove of the actuator 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.

2.9.2 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 8 and 9 on page 53.

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



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

120 to 350 cm² actuators with 15 mm rated travel.

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

2.9.3 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 8 and 9 on page 53.

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).

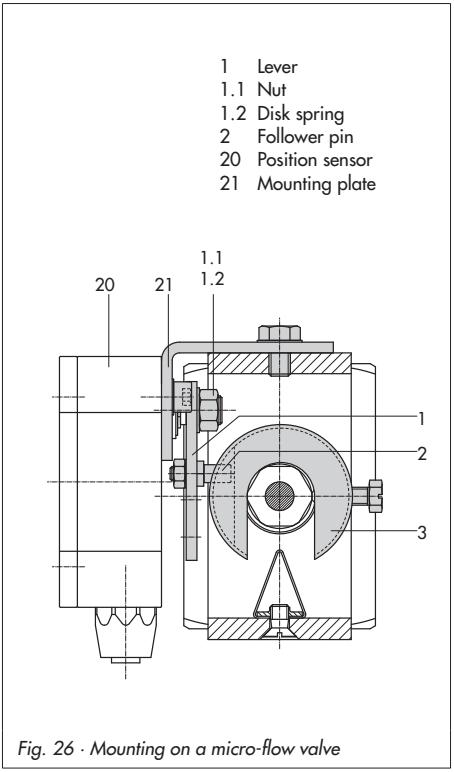


Fig. 26 · Mounting on a micro-flow valve

2.9.4 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 8 and 9 on page 53.

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 (Ø 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 2.7 Instead of the positioner, attach the position sensor (20) with its mounting plate (21).

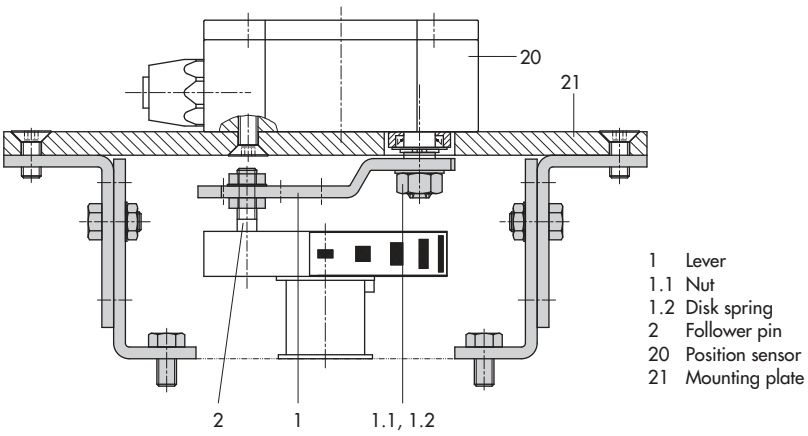


Fig. 27 · Mounting on rotary actuators

Table 8	Attachment of external position sensor		Order no.
Template for mounting the position sensor on older mounting parts. See note on page 40.			1060-0784
Direct attachment	Mounting parts for actuators with 120 cm² see Fig. 24 left		1400-7472
Accessories for actuator 120 cm²	Connecting plate (9, old) for Actuator Type 3277-5xxxxxx.**00**	G ⅛	1400-6820
		⅛ NPT	1400-6821
	Connecting plate (new) for Actuator Type 3277-5xxxxxx.**01** (new) [1]		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 175, 240, 350, 355 and 750 cm², see Fig. 24 right		1400-7471
NAMUR attachmt	Mounting parts for attachment to NAMUR rib with lever L and XL, see Fig. 25		1400-7468
Micro-flow valve	Mounting parts for Type 3271 Actuator with 60 cm², see Fig. 19		1400-7469
Attachment to rotary actuators	VDI/VDE 3845 (September 2010), refer to section 16.1 for details		
	Actuator surface area corresponds to level 1		
	Size AA1 to AA4 with follower clamp and coupling wheel, version with CrNiMo steel bracket, see Fig. 27		1400-7473
	Size AA1 to AA4, heavy-duty version		1400-9384
	Size AA5, heavy-duty version (e.g. Air Torque 10 000)		1400-9992
	Bracket surface area corresponds to level 2, heavy-duty version		1400-9974
	SAMSON Type 3278 with 160 cm² (also for VETEC Type S160 and Type R), heavy-duty version		1400-9385
	SAMSON Type 3278 with 320 cm² and for VETEC Type S320, heavy-duty version		1400-5891 and 1400-9974

Table 9	Positioner accessories		Order no.
Accessories	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 and supply)	St. steel/brass	1402-0938
		St.st./st. steel	1402-0939
	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.		0309-0184

2.10 Attaching positioners with stainless steel housings

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

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

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

The Tables 1 to 5 (pages 10 and 20) 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 5 can be used except for the heavy-duty version. Connecting plate in stainless steel.

2.11 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, 175 to 750 cm²
FA: Remove the stopper 12.2 (Fig. 5 on page 25) at the connection block and make a pneumatic connection to the spring chamber on the vented side.

NOTICE
The method described does not apply to old connection blocks in powder-paint-coated aluminum. In this case, follow the instructions for attachment described below in "Attachment acc. to IEC 60534-6 (NAMUR rib or attachment to rod-type yokes) and to rotary actuators".

FE: The air purging function is automatically provided.

Attachment acc. to IEC 60534-6 (NAMUR rib or attachment to rod-type yokes) and to rotary actuators
The positioner requires an additional port for the exhaust air that can be connected

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

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

NOTICE

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

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

3 Connections

3.1 Pneumatic connections

NOTICE
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.

Note:
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 (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 [cm^2]
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

The following standards apply to installations in hazardous areas: EN 60079-14: 2008 (VDE 0165 Part 1) ***Explosive atmospheres - Electrical installations design, selection and erection****.*

NOTICE

- *The terminal assignment must be adhered to. Reversing the assignment of the electrical terminals may cause the explosion protection to become ineffective!*
- *Do not loosen enameled screws in or on the housing.*
- *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).*

Note on the selection of cables and wires:

To install intrinsically safe circuits, observe ***Clause 12 of EN 60079-14: 2008*** *(VDE 0165 Part 1).*
To run multi-core cables or lines with more than one intrinsically safe circuit, clause 12.2.2.7 of this standard applies.
Especially for commonly used insulating materials, such as polyethylene, the radial thickness of the conductor insulation must have a minimum thickness of 0.2 mm. The diameter of a single wire of a flexible conductor must not be smaller than 0.1 mm. Protect the conductor ends against splicing, e.g. by using wire-end ferrules.

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

Seal cable entries left unused with blanking plugs.

Devices used at ambient temperatures ***below –20 °C*** *must be fitted with metal cable glands.*

Equipment for use in zone 2/zone 22

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

For equipment connected to energy-limited circuits with type of protection Ex nL (energy-limited apparatus), the standard EN 60079-15: 2003 allows this type of equipment to be switched under normal operating conditions.

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

Cable entry

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 (tightening torque of screws 0.5 to 0.6 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****.*

Accessories:

Cable gland M20 x 1.5	Order no.
Black plastic (6 to 12 mm clamping range)	8808-1011
Blue plastic (6 to 12 mm clamping range)	8808-1012
Nickel-plated brass (6 to 12 mm clamping range)	1890-4875
Nickel-plated brass (10 to 14 mm clamping range)	1922-8395
Stainless steel 1.4305 (8 to 14.5 mm clamping range)	8808-0160
EMC cable Nickel-plated brass	8808-0143

Adapter M20 x 1.5 to ½ NPT	
Aluminum, powder paint coated	0310-2149
Stainless steel	1400-7114

Bus line

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*

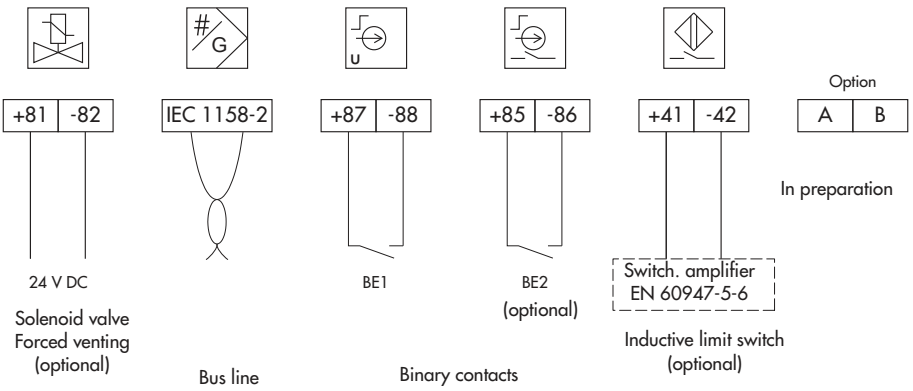


Fig. 28 · Electrical connections

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 solenid valve for the forced venting function, a voltage of 24 V DC must be connected to the relevant terminals +81 and –82.

NOTICE
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. 29) 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).

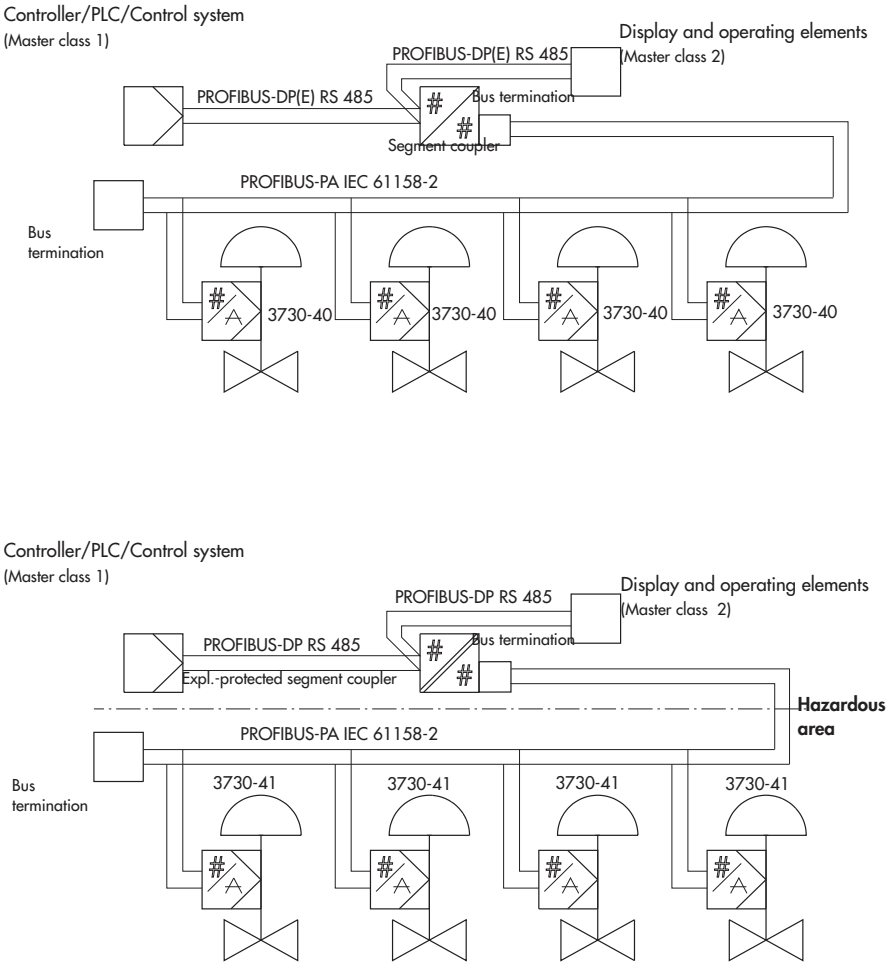


Fig. 29 · Connection according to PROFIBUS, for safe areas (top) and hazardous areas (bottom)

4 Operation

Note: *A summary about operating and start up can be found in section 8 on page 87.*

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 2.8): 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:

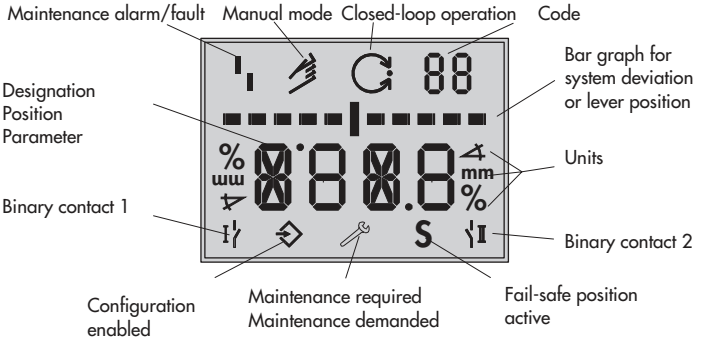
- For actuators smaller than 240 cm² with a loading pressure connection at the side (Type 3271-5), set restriction to MIN SIDE.
- For a connection at the back (Type 3277-5), set restriction to MIN BACK.
- For actuators 240 cm² and larger, set to MAX SIDE for a side connection and to MAX BACK for a connection 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	***RES***	Reset	blinking	Emergency mode (error code 62 x signal, see p. 132)
CL	Clockwise	***RUN***	Start		
CCL	Counterclockwise	***SAFE***	Fail-safe position		
Err	Error	***SUb***	Substitute calibration		
ESC	Escape	***TunE***	Initialization in progress	blinking	Not initialized
LOW	w too small	***YES***	Available		
MAN	Manual mode	***ZP***	Zero calibration	S blinking	No valid setpoint exists or valve has been moved to fail-safe position by SET_FAIL_ SAFE_POS (see p. 102)
MAX	Maximum range	***tEStinG***	Test function active		
NO	Not available				
NOM	Nominal travel	↗↗	Increasing/increasing		
O/C	Type of application on/off	↗↘	Increasing/decreasing		
ON	On				and together AO Transducer Block is in MAN mode
OFF	Off				



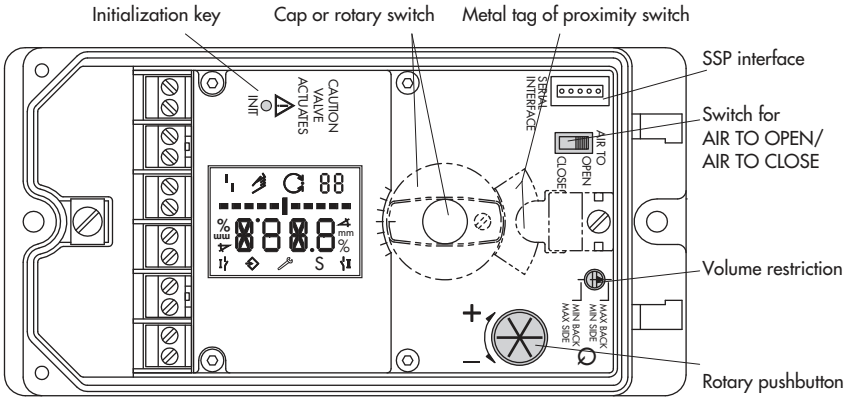
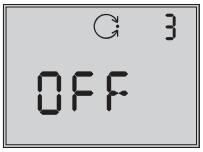


Fig. 30 · Display and operator controls

4.2 Enabling and selecting parameters

The codes which are marked with an asterisk (*) in section 15.1 on page 119 onwards must be enabled with Code 3 before the associated parameters can be configured as described below.



Code ***3***
Configuration not enabled

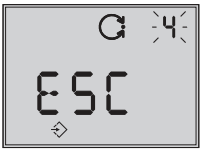
Configuration enabled

- 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 15.1 on page 119 onwards shows all parameters that can be adjusted, including their description and their default settings.

Note:
After attaching the positioner to the valve, defining the valve closed position and setting 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 70).
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 80).

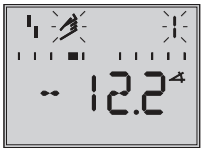
4.3 Operating modes

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.

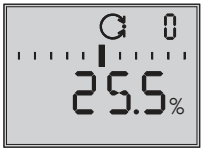
To proceed, turn ⊛ button clockwise until Code ***1*** appears, then confirm Code ***1*** by pressing the ⊛ button.



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 ↻.

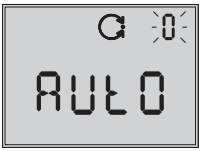


Default

Switching to manual operating mode

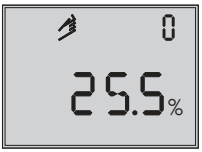
Over Code ***0***, press the ⊛ button, ***AUtO*** appears in the display, Code ***0*** blinks.

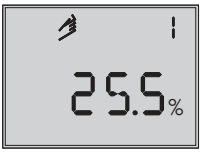
Turn ⊛ button until ***MAN*** appears.



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 178).*

5 Start-up and settings

Note: *A summary about start-up and operation can be found in section 8 on page 87.*

- 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 102).*

5.1 Defining the valve closed position

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

AIR TO OPEN = Signal pressure opens the valve, for fail-safe position: actuator stem extends/fail close

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

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 direction of action of the actuator has been changed.

5.2 Setting the volume restriction Q

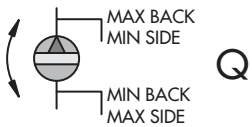


Fig. 31 · Volume restriction Q MAX BACK/MIN SIDE setting

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*

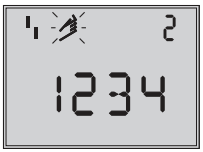
Signal pressure \ Transit time	< 1 s	≥ 1 s
Connection at the side	MIN SIDE	MAX SIDE
Connection at the back	MIN BACK	MAX BACK

* 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.

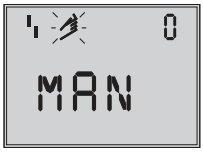
5.4 Limiting the signal pressure

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.

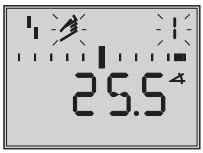
The required signal pressure limit is only automatically recognized on initialization when the valve closed position AIR TO OPEN is set.

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 66).*

---

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.

NOTICE
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.

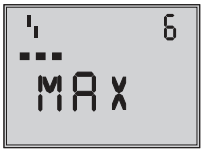
NOTICE
After the positioner has been mounted onto another actuator or its mounting location has been changed or prior to re-initializing the positioner, the positioner needs to be reset to its default settings. Refer to section 5.9 on page 80.

▶ **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 actu-

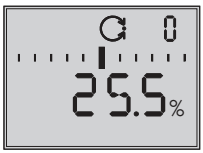
ator and take several minutes.
Positioners with EXPERT+ diagnostic functions start plotting the reference graphs after the initialization process has been completed. See note at the end of this section.

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 78.

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:

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

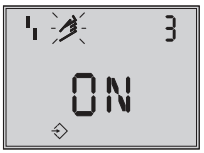
After enabling configuration with Code ***3*** and accessing Code ***6***, you can choose one of the initialization modes ***MAX***, ***NOM***, ***MAN*** or ***SUb*** to start initialization.
ZP, the zero calibration is described in section 5.8 on page 79.

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 %.

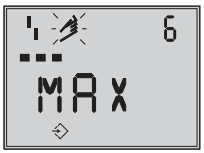
Enable configuration:



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 71.

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 (Co*de **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.*

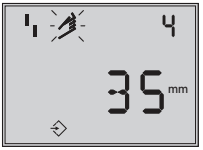
Enable configuration:

Default ***OFF***

Turn ⊛ → Code ***3***, press ⊛,

turn ⊛ → ***ON***, press ⊛.

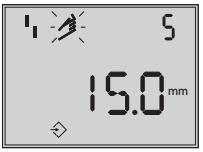
After enabling:



Default ***OFF***

Turn ⊛ → Code ***4***, press ⊛,

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

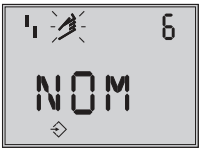


Default ***15***

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.

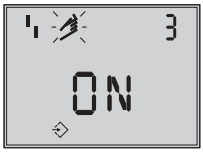
Positioners with EXPERT+ diagnostic functions automatically start plotting the reference graphs after the initialization process has been completed. See page 71.

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. Turn it clockwise in small steps. The valve must move to the required valve position with a monotonically increasing signal pressure.
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.

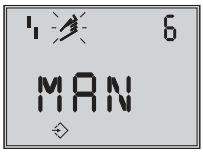
Enable configuration:



Default ***OFF***

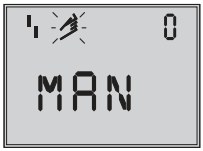
Turn ⊛ → Code ***3***, press ⊛,
turn ⊛ → ***ON***, press ⊛.

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



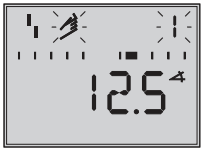
Default ***MAX***

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 71.

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.

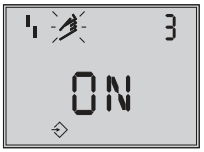
The initialization mode ***SUb*** is used to replace a positioner while the process is in operation. For this purpose, the control valve is usually fixed mechanically in a certain position, or pneumatically by means of a pressure signal which is routed to the actuator externally. The blocking position 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 defining the valve closed position with the AIR TO OPEN/CLOSE switch, 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 77.

Enable configuration:

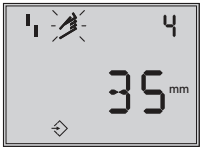


Default ***OFF***

Turn ⊛ → Code ***3***, press ⊛,

turn ⊛ → ***ON***, press ⊛.

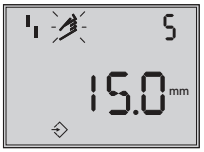
After enabling:



Default ***OFF***

Turn ⊛ → Code ***4***, press ⊛,

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

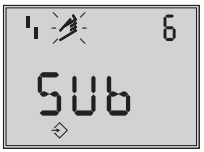


Default ***15***

Turn ⊛ → Code ***5***, press ⊛,

turn ⊛ → Enter nominal travel/angle,

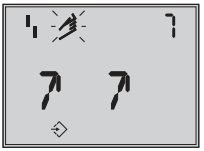
press ⊛.



Default ***MAX***

Turn ⊛ → Code ***6***, press ⊛,

turn ⊛ → ***SUb***, press ⊛.

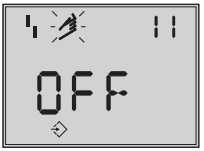


Default ↗↗

Turn ⊛ → Code ***7***, press ⊛,

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

Press ⊛.

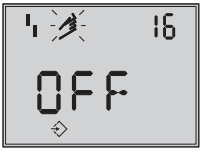


Default ***100.0***

Turn ⊛ → Code ***11***, press ⊛,

turn ⊛ → Deactivate travel limit,

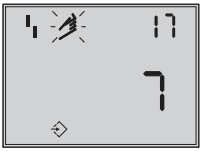
press ⊛.



Default ***OFF***

Turn ⊛ → Code ***16***,

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



Default ***7***

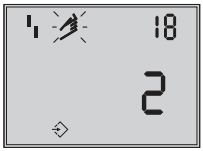
Turn ⊛ → Code ***17***

Retain default. Proceed as follows only if known:

Press ⊛,

turn ⊛ → Select KP,

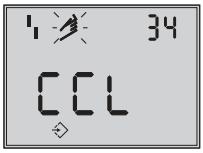
press ⊛.



Default ***2***

Turn ⊛ → Code ***18***,

Retain default TV, change only if known.



Default ***CCL***

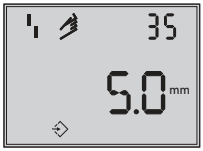
Turn ⊛ → Code ***34***, press ⊛,

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***

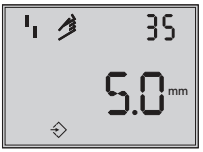
Turn ⊛ → Code ***35***, press ⊛,

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 **valve closed position** AIR TO OPEN or AIR TO CLOSE as described in section 5.1 on page 51.
- Set volume restriction as described in section 5.2 on page 67.
- **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:

Turn ⊛ → 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 79.

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:

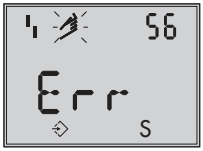
Condensed status	Display
Maintenance alarm	
Maintenance required/ Maintenance demanded	
Function check	Text
No message	

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	

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 15.1 on page 119 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 %.*

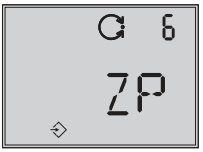
Enable configuration:

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 15.1).

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.

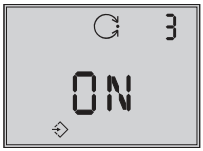
The positioner can be supplied with power by connecting it either to a fieldbus segment or over a DC voltage source (9 to 32 V) connected to the bus terminals in the positioner. A suitable intrisically safe source mut be used within the hazardous area and the safe area when an intrinsically safe positioner is used.
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.

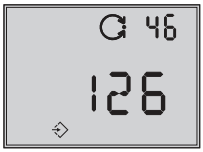
Enable configuration:



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 under 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 14.5 on page 112).

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. 32):

- **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 alarms 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 15.1). 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.

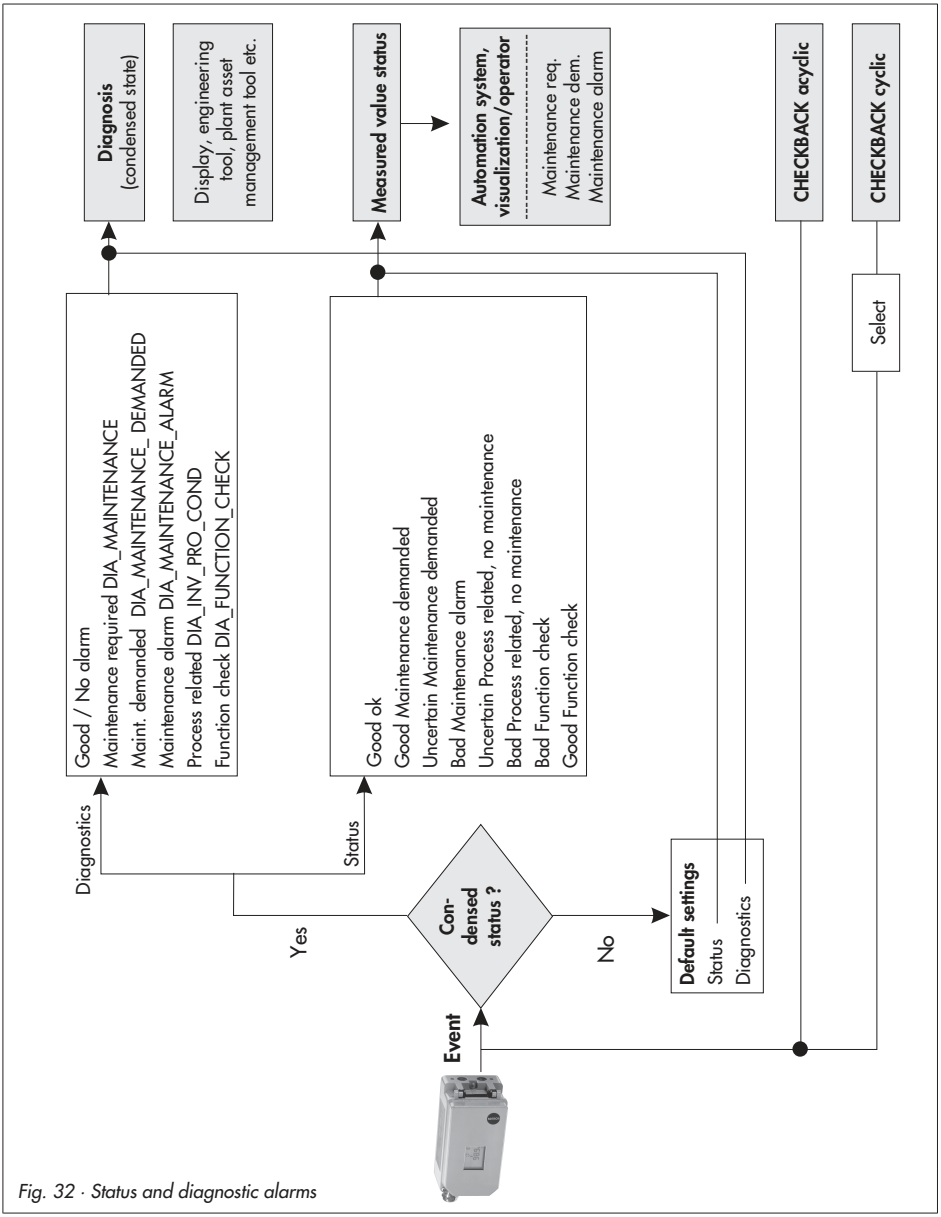


Fig. 32 · Status and diagnostic alarms

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).

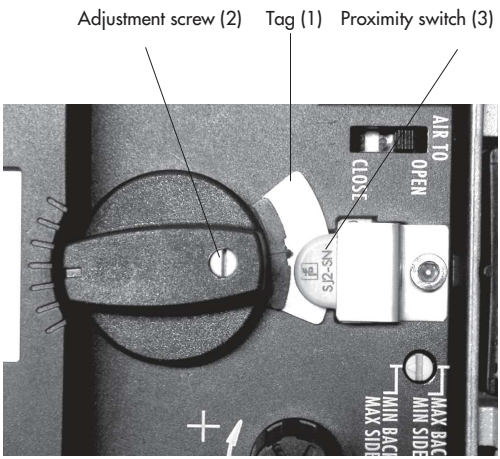


Fig. 33 · Adjustment of the limit switch

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 cm^2	Pin position
7.5	120	25
15	120/175/240 /350	35
15/30	700/750	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 valve closed position

Position the slide switch according to closed 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.

NOTICE
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 119 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***, ↵

NOTICE
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.*

---

9 Retrofitting an inductive limit switch

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

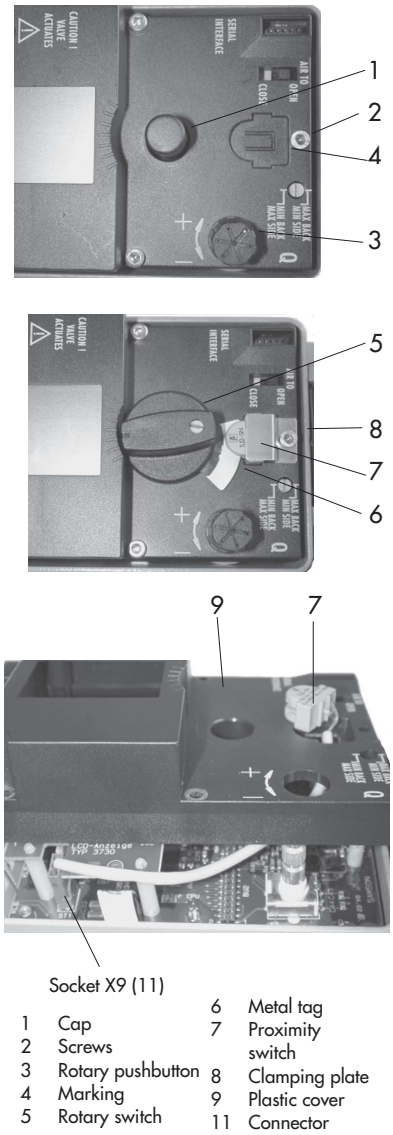
Note: *The same requirements apply to retrofitting an inductive limit switch as to servicing the positioner. For explosion-protected devices, the requirements in section 11 need to be kept.*
Check the "Limit switch, inductive" box on the nameplate after retrofitting the limit switch.

---

1. Take off the rotary pushbutton (3) and cap (1), unthread the five fixing screws (2) and lift off the plastic cover (9) together with the display, **taking care not to damage the ribbon cable (between PCB and display).**
2. Use a knife to cut an opening at the marked location (4).
3. Push the connector (11) with cable through the opening and secure the proximity switch (7) on the cover with a dot of glue.
4. Insert the cable connector (11) at the socket X9.
5. Guide the cable in such a manner that the plastic cover can be placed back onto the positioner. Insert the fixing screws (2) and screw tight. Attach the clamping plate (8) onto the proximity switch.
6. Attach the rotary switch (5). Make sure the flattened side of the positioner shaft is turned so that the rotary switch (5) can

be attached with the metal tag next to the proximity switch.

7. **Note:** On start-up of the positioner, set the option "inductive alarm" under Code ***38*** from ***NO*** to ***YES***.



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. 34 · Retrofitting an inductive limit switch

10 Maintenance

The positioner does not require any maintenance.

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

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

11 Servicing explosion-protected devices

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

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

Devices that have already been operated outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed on serviced devices. Before being used inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

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

12 Firmware update (serial interface)

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

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

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

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

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

a) **Updates outside the hazardous area:**

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

b) **Updates on site:**

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

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

13 Maintenance, calibration and work on equipment

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

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

14 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.

14.1 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”.

14.2 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 14.3 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 14.4 for measured value status.

14.2.1 GSD files

The General Station Description file (GSD file) is included in the scope of delivery for every PROFIBUS positioner and supplies all information required for the cyclic exchange of process data (set point, status, etc.) with the host system and for configuring the PROFIBUS network. Each positioner and its GSD file has a unique ID number (ident number) assigned to it. This allows the host to check the compatibility between the configuration in the system and the device used.

The ID number (ident number) of the GSD file must be the same as the ID number of the device to ensure successful integration.

The ID number adaptation feature allows a Type 3785 Positioner to be replaced by a Type 3730-4 Positioner without having to exchange the GSD file in the host system.

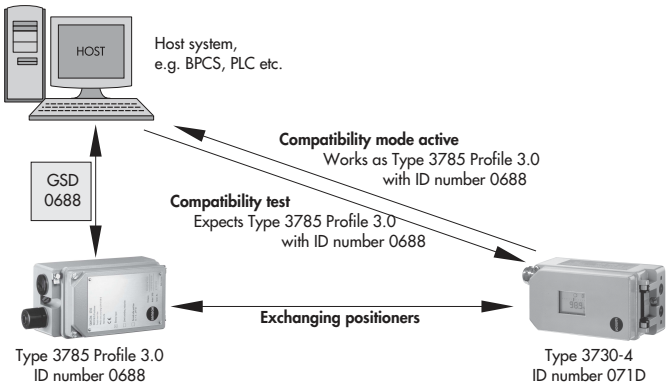


Fig. 35 · Exchanging positioners with automatic ID number adaptation

The host performs a compatibility test by checking the configured GSD file/ID number before starting cyclic data exchange. If the positioner is in the compatibility (adaptation) mode, the positioner also accepts the GSD files/ID numbers of the Type 3785 Positioner (Profile 2.0 and 3.0) and goes into cyclic data exchange.

For communication with the automation system, just the features of the active positioner (active ID number) are supported.

Example: If the Type 3730-4 Positioner is operated in the compatibility (adaptation) mode for Type 3785 Profile 3.0, the diagnosis telegram then communicates as with Type 3785. Diagnosis bits, which were first introduced with Profile 3.01, are not set. Additionally, the DI Blocks of Type 3730-4 cannot be used as they are not available in Type 3785.

When replacing the Type 3785 Positioner with the Type 3730-4 Positioner, the following steps must be taken:

NOTICE

– *The Type 3730-4 Positioner must be mounted and connected properly (see sections 2 and 3.)*
– *Configuration over PROFIBUS must be performed with the associated EDD or DTM of Type 3730-4 as this is the only way to access the device parameters.*

---

1. Change the bus address of Type 3730-4 to the same bus address as Type 3785. This can be done over PROFIBUS (DEVICE_ADDRESS parameter), using TROVIS-VIEW configuration and operator interface or in Code 46 in the positioner.
2. Put positioner into operation (see section 5).

Note: *After initialization (in step 2), the positioner is in compatibility (adaptation) mode (IDENT_NUMBER_SELECTOR parameter in the Physical Block). Do not change this setting.*

14.2.2 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 Value	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 Value	DI_OUT Status

14.2.3 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!

14.2.4 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 63). First when a valid set point (status ≥ 0x80) is set, the positioner leaves the fail-safe position and follows the reference variable.

14.3 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	
0	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
	4…6	Not assigned		
	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 131). 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 131). 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 131)	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

14.4 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.

14.4.1 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
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

Fault/diagnostic alarm	Value (hex)	Status alarm acc. to Profile 3.01
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
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

Fault/diagnostic alarm	Value (hex)	Status alarm acc. to Profile 3.01
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
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

Fault/diagnostic alarm	Value (hex)	Status alarm acc. to Profile 3.01
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

14.4.2 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
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	•		–

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
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
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	•		–

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
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	•		–
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	•		–

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
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	•		–
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	•		–

Fault/diagnostic alarm		Default setting acc. to Profile 3.01 Condensed Status	Classified		Diagnosis
			Yes	No	
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 K 1.10 and higher. See FEATURE_SELECT parameter on page 136.

14.5 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 136).
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		

Octet	Bit	Explanation	Note
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)	
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

Octet	Bit	Explanation	Note
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)	
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	

Octet	Bit	Explanation	Note
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
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

Octet	Bit	Explanation	Note
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
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. Refer to page 140.

14.6 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.

15 Appendix

15.1 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. Codes 21/22 have priority over Codes 14/15.
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. Codes 21/22 have priority over Codes 14/15. 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 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. Code 21 has priority over Code 15. **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. Code 22 has priority over Code 14. **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	**∆x > range**	The measuring span of the sensor is too low. • Pin positioned incorrectly. • Wrong lever. A rotational angle smaller than 16° at the positioner shaft creates just an alarm. An angle below 9° 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 79). 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.

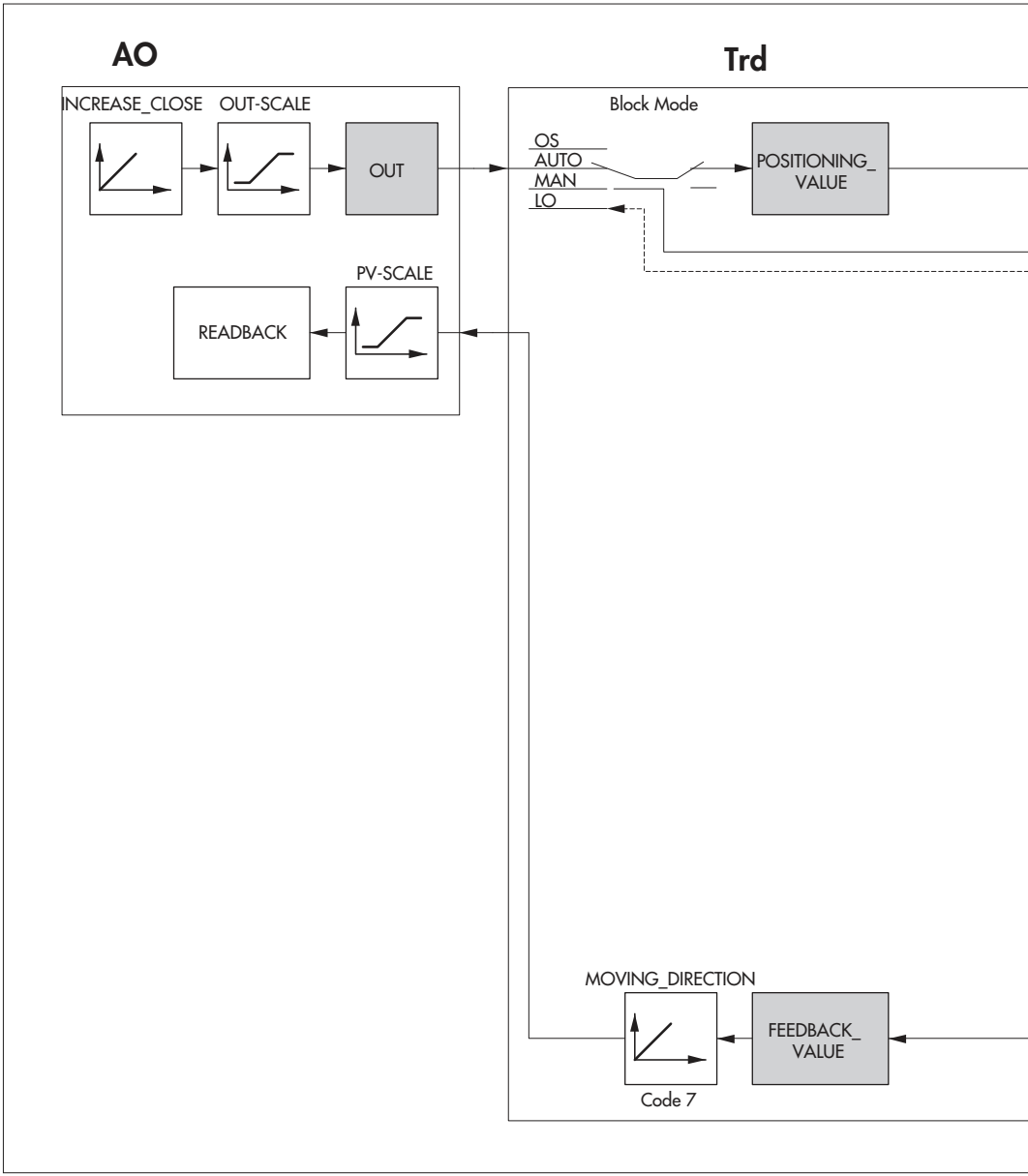
Error codes – Recommended action		Condensed status alarm active, when prompted, ***Err*** appears.
76	**No emergency mode**	The travel measuring system of the positioner has a self-monitoring function (see Code 62). A controlled emergency mode is not available on certain actuators, such as double-acting 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.

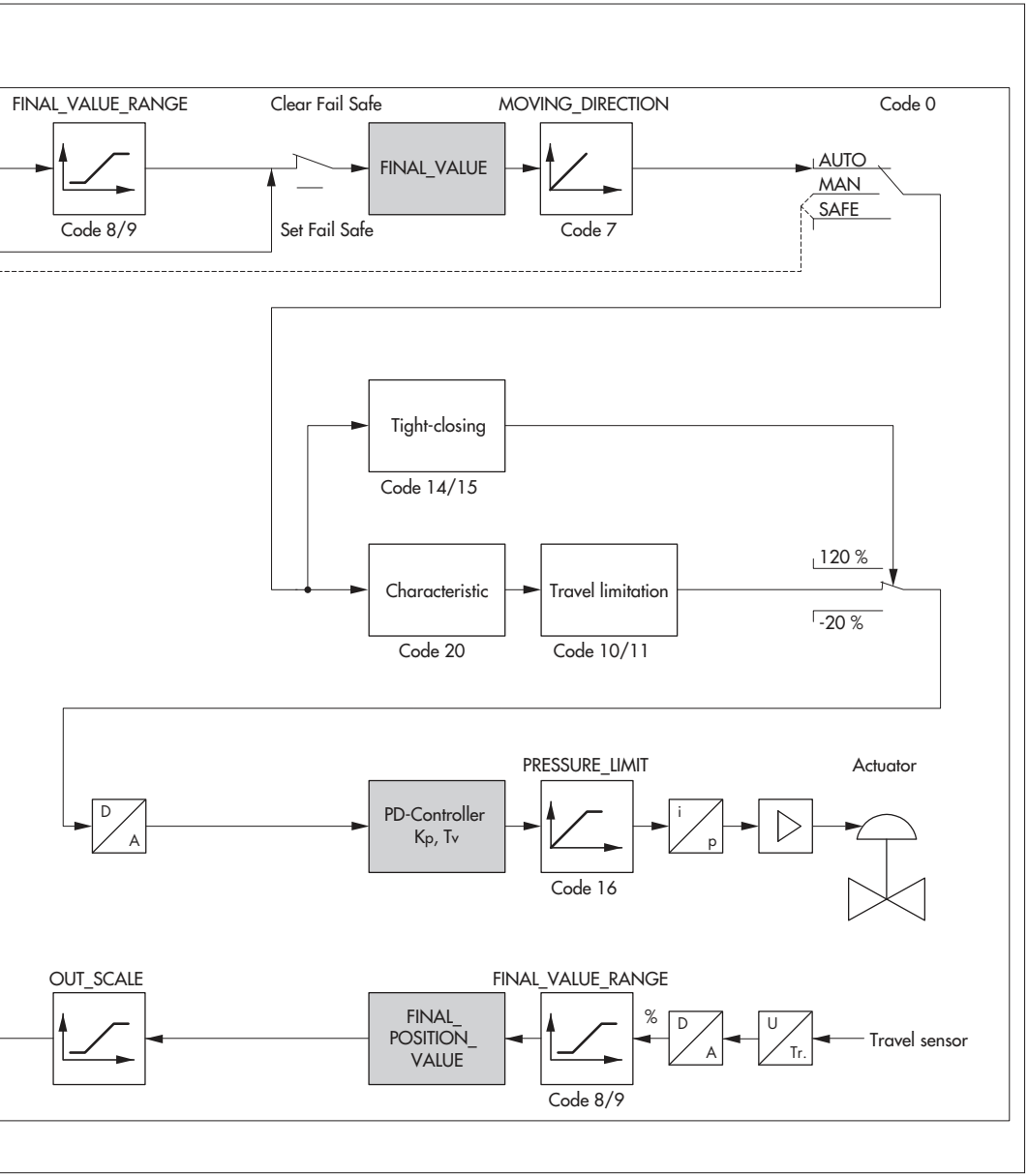
15.2 Parameter lists

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: *Parameters 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) 2 = Compatibility mode
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

Index	Parameter
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

Index	Parameter
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 114.
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

16 Dimensions in mm

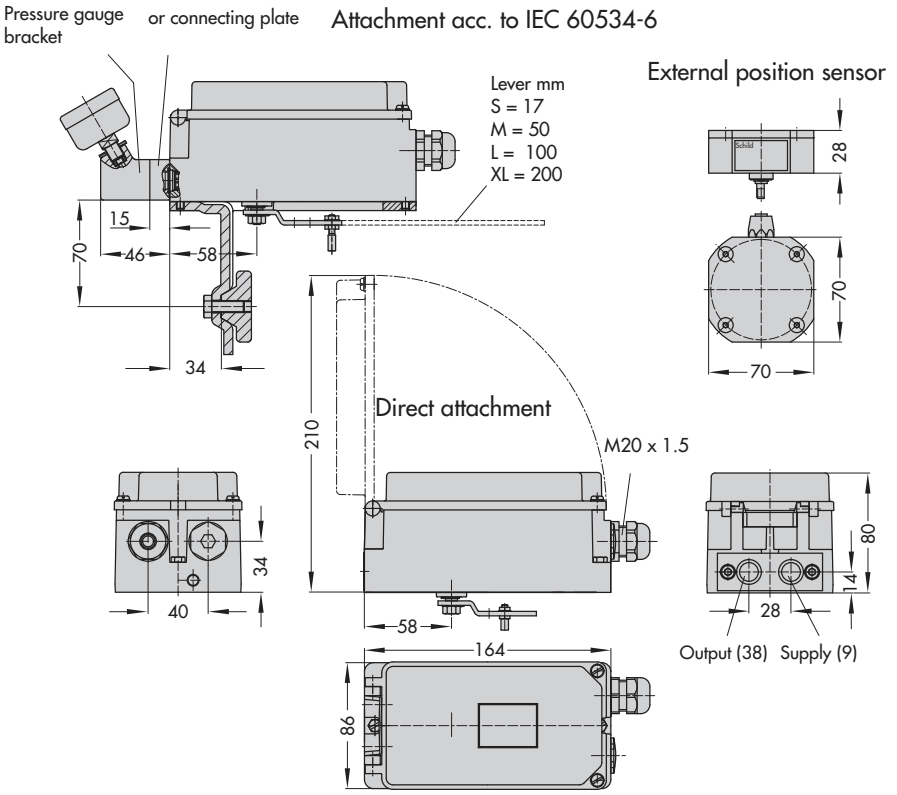
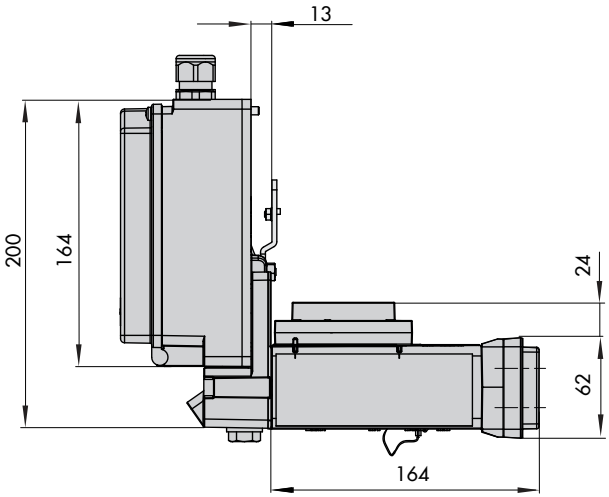


Fig. 29a · NAMUR and direct attachment

Attachment according to VDI/VDE 3847
onto Type 3277



Attachment according to VDI/VDE 3847
onto NAMUR rib

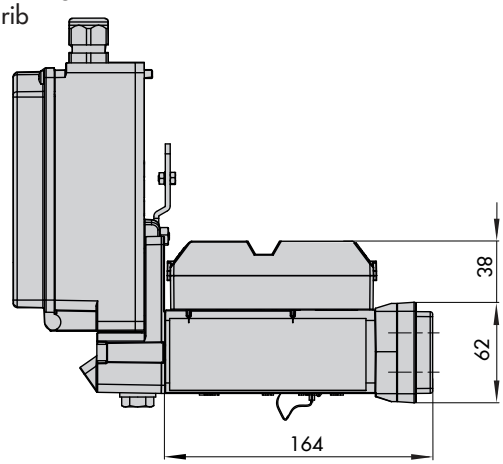
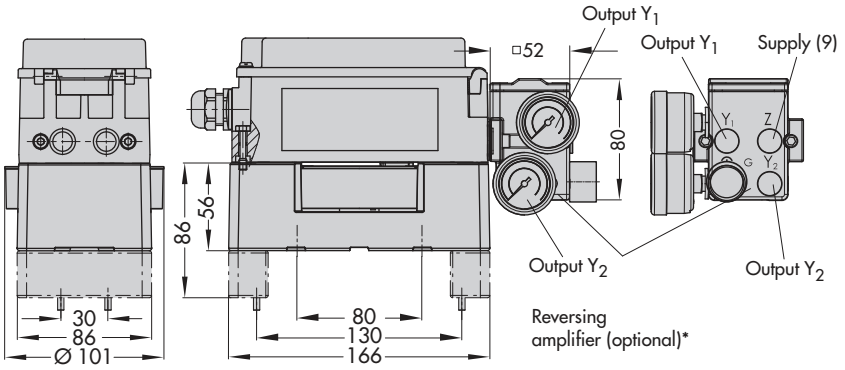
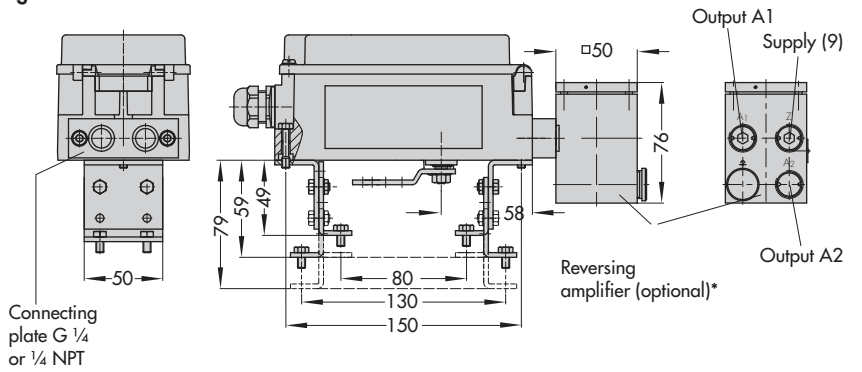


Fig. 29b · Attachment according to VDI/VDE 3847

Heavy-duty version



Light version

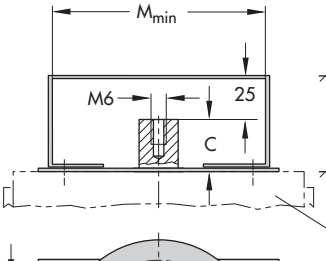


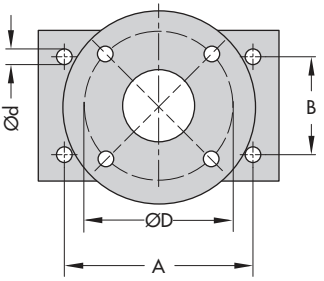
* Reversing amplifier

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

Fig. 29c · Attachment to rotary actuators acc. to VDI/VDE 3845 (Sept. 2010), fixing level 1, size AA1 to AA4

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





Dimensions in mm

Size	A	B	C	∅d	M_{min}	∅D*
AA0	50	25	15	5.5 for M5	66	50
AA1	80	30	20	5.5 for M5	96	50
AA2	80	30	30	5.5 for M5	96	50
AA3	130	30	30	5.5 for M5	146	50
AA4	130	30	50	5.5 for M5	146	50
AA5	200	50	80	6.5 for M6	220	50

* Flange type F05 according to DIN EN ISO 5211

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	IL 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

Page **2** of **4**

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

IECEx Certificate of Conformity

Certificate No.: IECEx PTB 06.0054

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

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

Annex to Certificate of Conformity IECEx PTB 06.0054

Equipment:	Model 3730-41 Profibus PA Positioner Model 3730-51 FOUNDATION FF Positioner	
Submitted by:	SAMSON AG Mess- und Regeltechnik Weismüllerstrasse 3, 60314 Frankfürt	
Manufactured by:	SAMSON AG Mess- und Regeltechnik Weismüllerstrasse 3, 60314 Frankfürt	
Groups:	**IIC / IIB**	
Type of Protection:	**ia**	
Temperature Classification:.	**T6 / 60°C**	
Degree of Ingress Protection:	**IP 54 IP 65 und IP 66**	

Conditions of Manufacture

Routine testing and high-voltage testing between the individual circuit and the enclosure with 500V, 50Hz, 1min.

Schedule

The positioners come in several versions. The following model designation code applies:

3 730 - . . . . . .

- **System code number**
- **Positioner**
  - 4 = Profibus PA
  - 5 = FOUNDATION-Fieldbus
- **Ex- approvals**
  - 1 = Ex ia according EN and IECEx
- **Additional equipment**
- **Inductive limit switches**
  - 1 = provided
  - 0 = not provided
- **Zwangsentlüftung** (solenoid valve)
  - 4 = provided
  - 0 = not provided
- **Vibration sensor**
  - 2 = provided
  - 0 = not provided
- **Binary input**
  - 3 = provided
  - 0 = not provided
- **External position sensor**
  - 1 = provided
  - 0 = not provided

Annex to Certificate of Conformity IECEx PTB 06.0054

Connections

Pneumatic connections

Electric connections

1+2 = M 20x1,5 (plastic)

5+6 = M 20x1,5 (metal)

The dots in the model designation code will be substituted for numerals identifying the equipment version

Scope

Ex ia IIC/IIB T6 ; -40°C ≤ ta ≤ T6 60°C / -40°C ≤ ta ≤ T5 70°C / -40°C ≤ ta ≤ T4 80°C ; IP 54 or IP 65

"Testing and assessment according IEC 60079-0 and 60079-11" type of protection Ex ia IIC T6 degree of protection IP 54 and IP 65 according to IEC 60529

Table: Summary of results

	FOUNDATION Fieldbus				FISCO			
Group	**IIC**		**IIB**		**IIC**		**IIB**	
U [V]	24		24		20		24	
I [mA]	174(1)	360(2)	433(1)	380(2)	309(1)	360(2)	433(1)	380(2)
P [W]	2,08(1)	1,04(2)	5,16(1)	2,58(2)	3,09(1)	1,54(2)	5,16(1)	2,58(2)

$\mathbf{I_{(1)}}$ = maximum current for intrinsically safe resistive circuits according to EN 50020

$\mathbf{I_{(2)}}$ = maximum current according to Profibus User Organization

$\mathbf{P_{(1)}}$ = maximum power in the intrinsically safe circuit upon matching

$\mathbf{P_{(2)}}$ = maximum power in consumer upon matching

Model 3730-41 and 3730-51 i/p Positioners – Permissible maximum values for intrinsic safety according to EG Type Examination Certificate PTB 04 ATEX 2109

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 incompliance with a control signal. They are intended for attachment to either linear or rotary actuators.

Communication is optionally either according to Profibus PA in compliance with the FISCO concept (Typ 3730-41) or in accordance with the FOUNDATION™ Fieldbus Specification (Typ 3730-51)

The Model Typ 3730-41 and 3730-51 are passive two-terminal networks which may be connected to all certified intrinsically safe circuits, provided the permissible maximum values of Ui, Ii und Pi are not exceeded.

For instrument air noncombustible media are used.

The equipment is intended for use in hazardous locations.

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

Temperature class	Permissible ambient temperature ranges
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 Ex ia IIC/IIB
only for connection to an intrinsically safe circuit

The correlation between the type of protection and the electrical data is shown in the tables below:

Maximum values: **Model 3730-4..**

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

Maximum values: **Model 3730-5..**

FOUNDATION™	
Ex ia IIC	Ex 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

Limit switch, inductive (terminals 41/42)

Type of protection: Intrinsic safety EEx ia IIC,
only for connection to an 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 and the permissible ambient temperature ranges, maximum short-circuit currents and maximum power of the analyzers is shown in the table below:

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

Forced venting function (terminals 81/82)

Type of protection: Intrinsic safety Ex ia IIC
only for connection to an intrinsically safe circuit

Maximum values:

Ui = 28 V, Ii = 115 mA
Pi = 500 mW

Li = negligible
Ci = 5.3 nF

Binary input 1 (terminals 87/88)

Type of protection: Intrinsic safety Ex ia IIC/IIB
only for connection to an intrinsically safe circuit

Maximum values:

Ui = 30 V, Ii = 100 mA

Li and Ci = negligible

Binary input 2 (terminals 87/88)

Type of protection: Intrinsic safety Ex ia IIC/IIB
only for connection to an intrinsically safe circuit

Maximum values:

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

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

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

Li and Ci negligible

Serial interface BU

Type of protection: Intrinsic safety Ex 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 external capacitances and inductances is shown in the table below

Ex ia IIC	Ex 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:

U_i = 16 V, I_i = 25 mA
P_i = 64 mW

Li and Ci negligible

In case of interconnection the rules for interconnecting intrinsically safe circuits shall be complied with.

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

Type of protection: Intrinsic safety Ex 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 external capacitances and inductances is shown in the table below:

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

Li = 370 µH, Ci = 730 nF

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

EU-TYPE-EXAMINATION CERTIFICATE

(Translation)

(1)

(2) Equipment or Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

PTB 04 ATEX 2109 **Issue: 1**

(4) Product: Positioner, type 3730-41..., 3730-51..., 3730-45..., 3730-55...

(5) Manufacturer: SAMSON AG Mess- und Regeltechnik

(6) Address: Weismüllerstraße 3, 60314 Frankfurt, Germany

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 17-25139.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 60079-0:2012/A11:2013 EN 60079-11:2012 EN 60079-31:2014

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

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

II 2 G Ex ia IIC T6...T4 Gb and II 2 D Ex ia IIIC T80 °C Db or
II 2 D Ex tb IIIC T80 °C Db

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, May 11, 2017
On behalf of PTB:

Dr.-Ing. F. Lienesch
Regierungsdirektor

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sheet 1/7

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(13)

SCHEDULE

(14) **EU-Type Examination Certificate Number PTB 04 ATEX 2109, Issue: 1**

(15) Description of Product

The positioners of types 3730-41..., 3730-51..., 3730-45... and 3730-55... are communication-capable, bus-powered field devices which are used to assign a valve position to a control signal.

The bus interface connection (bus-coupling) can be performed according to the FISCO-concept for both specifications, Profibus PA and Foundation™ Fieldbus.

They are mounted onto levitation and slewing actuators. Non-flammable media are used as pneumatic auxiliary power. The equipment is intended for the application inside the hazardous area.

Thermal and electrical maximum values

Type 3730-41 and 3730-51:

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

Gas- or dust group	Temperature class	Permissible ambient temperature range
IIC	T6	-55 °C ... 60 °C
	T5	-55 °C ... 70 °C
	T4	-55 °C ... 80 °C
IIIC	not applicable	-55 °C ... 80 °C

For relationship between temperature class, permissible ranges of the ambient temperature, maximum short-circuit currents and maximum power for analyzing units with limit contacts (terminals 41/42), reference is made to the following table:

sheet 2/7

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SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

Temperature class	Permissible ambient temperature range	I_0 / P_0
T6	-55 °C ... 45 °C	52 mA / 169 mW
T5	-55 °C ... 60 °C	
T4	-55 °C ... 75 °C	
T6	-55 °C ... 60 °C	25 mA / 64 mW
T5	-55 °C ... 80 °C	
T4	-55 °C ... 80 °C	

BUS-connection-signal circuit ..... type of protection Intrinsic Safety Ex ia IIC / IIB / IIIC
(terminals 11/12) only for connection to a certified intrinsically safe circuit

For relationship between type of protection and electrical data, reference is made to the following table:

Maximum values:

FISCO power supply	FIELDBUS power supply general	
Ex ia IIC / IIB / IIIC	Ex ia IIC / IIIC	Ex ia IIB / IIIC
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 = 2,58 W

C_i = 5 nF
L_i = 10 µH

Limit contact, inductive ..... type of protection Intrinsic Safety Ex ia IIC / IIIC
(terminals 41/42) only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 16 V
I_i = 52 mA
P_i = 169 mW

C_i = 60 nF
L_i = 100 µH

resp.

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SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

U_i = 16 V
I_i = 25 mA
P_i = 64 mW

C_i = 60 nF
L_i = 100 µH

Forced deaeration..... type of protection Intrinsic Safety Ex ia IIC / IIIC
(terminals 81/82) only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 28 V
I_i = 115 mA

C_i = 5.3 nF
L_i negligibly low

Binary input 1..... type of protection Intrinsic Safety Ex ia IIC / IIIC
(terminals 87/88) for connection to an active contact circuit

Maximum values:

U_i = 30 V
I_i = 100 mA

C_i negligibly low
L_i negligibly low

Binary input 2..... type of protection Intrinsic Safety Ex ia IIC / IIB / IIIC
(terminals 85/86) only for connection to a passive floating contact circuit

Maximum values:

U_o = 5.88 V
I_o = 1 mA
P_o = 7.2 mW

For relationship between explosion group and permissible external capacitances and inductances, reference is made to the following table:

Ex ia IIC / IIIC	Ex ia IIB / IIIC
C_o = 2 µF	C_o = 16 µF
L_o = 10 mH	L_o = 1 H

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SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

C_i negligibly low
L_i negligibly low

Serial Interface .....type of protection Intrinsic Safety Ex ia IIC / IIB / IIIC
(programming socket BU)

Maximum values:

U_o = 8.61 V
I_o = 55 mA
P_o = 250 mW

For relationship between type of protection and permissible external capacitances and inductances, reference is made to the following table:

Ex ia IIC / IIIC	Ex ia IIB / IIIC
C_o = 0.61 µF	C_o = 4 µF
L_o = 9 mH	L_o = 9 mH

resp.

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 16 V
I_i = 25 mA
P_i = 64 mW

C_i negligibly low
L_i negligibly low

External position sensor .....type of protection Intrinsic Safety Ex ia IIC / IIIC
(analog circuit board, pins p9, p10, p11)

Maximum values:

U_o = 8.61 V
I_o = 55 mA
P_o = 250 mW

For relationship between type of protection and permissible external capacitances and inductances, reference is made to the following table:

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SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

Ex ia IIC / IIIC	Ex ia IIB / IIIC
C_o = 0.61 µF	C_o = 4 µF
L_o = 9 mH	L_o = 9 mH

C_i = 730 nF
L_i = 370 µH

Type 3730-45... und 3730-55...:

The permissible range of the ambient temperature for dust groupe IIIC is -55 °C ... 80 °C.

BUS-connection signal circuit .....Nominal signal: 24 V DC
(Terminals 11/12).....Rated voltage: 28 V

Binary input 1.....Nominal signal: 6 ... 30 V DC
(Terminals 87/88) .....Rated voltage: 30 V

Binary input 2.....only for connection to a passive floating
(Terminals 85/86).....contact circuit

Limit contact, inductive .....Nominal signal: 8 V DC, 8 mA
(Terminals 41/42) .....Rated voltage: 16 V

Forced deaeration.....Nominal signal: 6 ... 24 V DC
(Terminals 81/82) .....Rated voltage: 28 V

Changes against previous issue:

The changes concern the update of the applied standards, the electrical data, the adding of another type notation for dust ignition protection by enclosure, the implementation of dust ignition protection by Intrinsic Safety, the application of alternative gasket material of the enclosure and alternative construction of the enclosure.

(16) Test Report PTB Ex17-25139

(17) Specific conditions of use

none

EU-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
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SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

(18) Essential health and safety requirements

Met by compliance with the aforementioned standards.

According to Article 41 of Directive 2014/34/EU, EC-type examination certificates which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such EC-type examination certificates and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB:

Dr.-Ing. F. Lienesch
Regierungsdirektor

Braunschweig, May 11, 2017

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(1) # CONFORMITY STATEMENT
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) Test Certificate Number:

PTB 05 ATEX 2010 X **Issue: 1**

(4) Product: Positioner type 3730-48... and 3730-58...

(5) Manufacturer: SAMSON AG Mess- und Regeltechnik

(6) Address: Weismüllerstraße 3, 60314 Frankfurt, Germany

(7) This product and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential test report PTB Ex 17-25140.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2012/A11:2013 EN 60079-15:2010 EN 60079-31:2014

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

(11) This Conformity Statement relates only to the design and construction of the specified product in accordance with Directive 2014/34/EU. Further requirements of this Directive apply to the manufacture and supply of this product.

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

Ex II 3 G Ex nA IIC T6 Gc bzw. II 3 D Ex tc IIIC T80 °C Dc

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, June 22, 2017
On behalf of PTB

Dr.-Ing. F. Lienesch
Regierungsdirektor

Sheet 1/3

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(13) # SCHEDULE

(14) **CONFORMITY STATEMENT PTB 05 ATEX 2010 X, Ausgabe: 1**

(15) Description of the product

The positioners of types 3730-48... and 3730-58... are communication-capable, bus-powered field devices which are used to assign a valve position to a control signal.

They are mounted onto levitation and slewing actuators. Non-flammable media are used as pneumatic auxiliary power. The equipment is intended for the application inside the hazardous area.

Thermal and electrical maximum values:

The permissible ambient temperature range for dust group IIIC is between -55 °C ... 80 °C.

For the relationship between temperature class and permissible ranges of the ambient temperature for gas group IIC reference is made to the following table:

Temperature class	permissible ambient temperature range
T6	-55 °C ... 60 °C
T5	-55 °C ... 70 °C
T4	-55 °C ... 80 °C

BUS-connection signal circuit (Terminals 11/12)	Nominal signal: Rated voltage:	24 V DC 28 V
Binary input 1 (Terminals 87/88)	Nominal signal: Rated voltage:	6 ... 30 V DC 30 V
Binary input 2 (Terminals 85/86)	only for connection to a passive floating contact circuit	
Limit contact, inductive (Terminals 41/42)	Nominal signal: Rated voltage:	8 V DC, 8 mA 16 V
Forced deaeration (Terminals 81/82)	Nominal signal: Rated voltage:	6 ... 24 V DC 28 V

Sheet 2/3

Conformity Statements without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
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SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 05 ATEX 2010 X, Issue: 1

Changes against previous issue:

The changes concern the update of the applied standards, the electrical data, the cancelation of type of protection "nL", the adding of dust ignition protection by enclosure, the application of alternative gasket material of the enclosure and alternative construction of the enclosure.

(16) Test report PTB Ex 17-25139

(17) Specific conditions of use

The program-interface intended for connection to the positioners of types 3730-48... and 3730-58... shall be installed outside of the hazardous area.

For type of protection "nA" applies:

If the program-interface adaptor is connected to a circuit of type of protection "nA" a fuse according to IEC 60127-2/II, 250 V F or according to IEC 60127-2/VI, 250 V T with a nominal fuse current of max. $I_N \leq 40$ mA shall be connected in series to the Vcc-circuit. The fuse shall be arranged outside of the hazardous area.

(18) Essential health and safety requirements

Met by compliance with the aforementioned harmonized standards.

According to Article 41 of Directive 2014/34/EU, Conformity Statements which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such Conformity Statements and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB:

Dr.-Ing. F. Lienesch
Regierungsdirektor

Braunschweig, June 22, 2017

Installation Manual for apparatus certified by CSA 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)** 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.

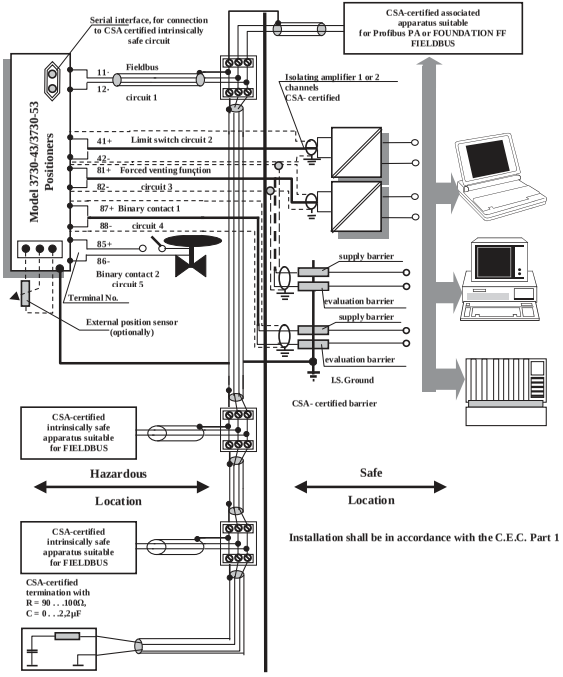
Notes:

1. Approved associated apparatus must be installed in accordance with manufacturer instructions
2. Approved associated apparatus must meet the following requirements:
   Voc ≤ Vmax, Isc ≤ Imax, Po ≤ Pmax
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:
    Co ≥ Ci + Ccable; Lo ≥ Li + Lcable

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 C_a	##########							2µF	0,61µF	###
L_i [µH]	10				100	0	0	###	###	0
L_0 or L_a	##########							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): Voc ≤ 28V max. and Rmin ≥ 245 Ω
- Return channel (connect to Terminal 82): ≤ 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 ≤ 30V and Rmin ≥ 300 Ω
- Return channel (connect to Terminal 88): Voc ≤ 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

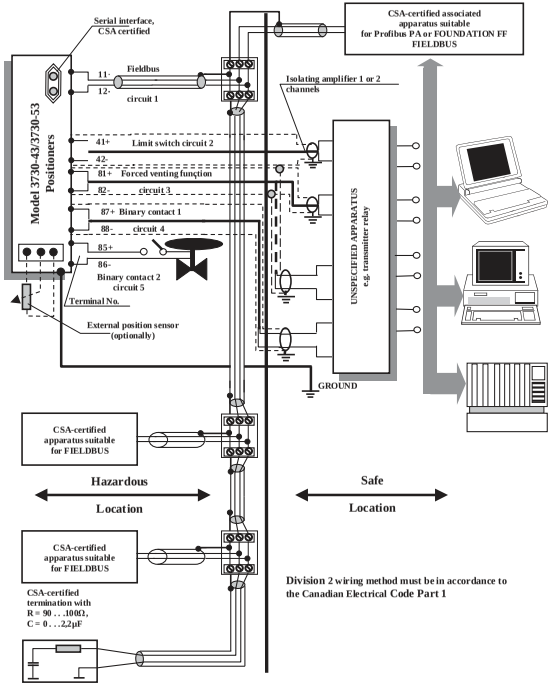
Table 4: Energy-Limited (Non- Incendive) Parameters

	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:

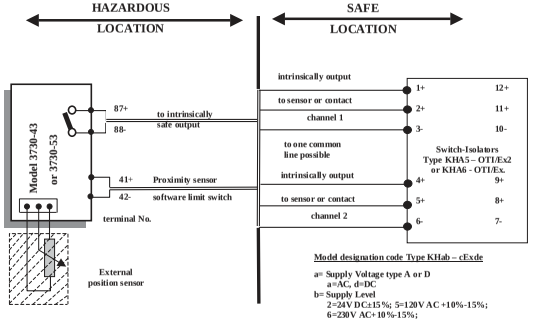
Ex nA II T6 / Ex nL IIC T6
Class I, Div. 2; Groups A, B, C, D; Class II, Div. 2 Groups E, F + G; Class III

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, ZS.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 V**max**, **Io or Isc ≤** Ii or I**max**, **Po ≤** Pi or P**max**
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**

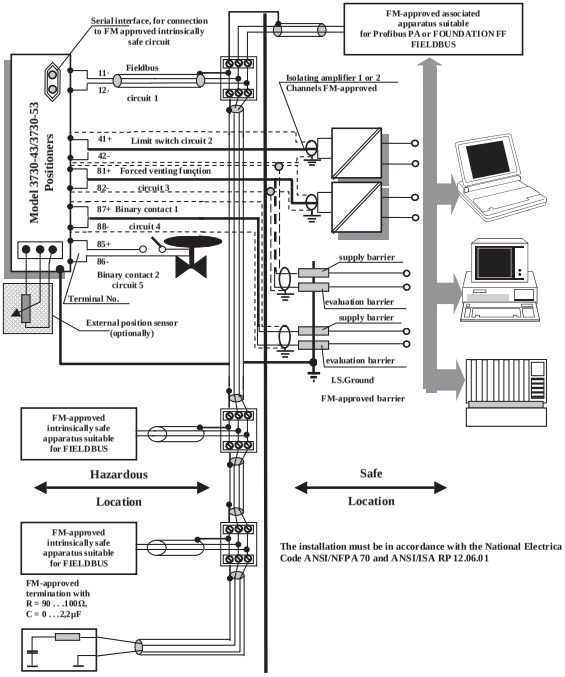


Table 1: Maximum values

	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_{0C} 5,88	V_{0C} 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_{0C}	R_{min}	I_{0C}	P_{max}	V_{0C}	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:

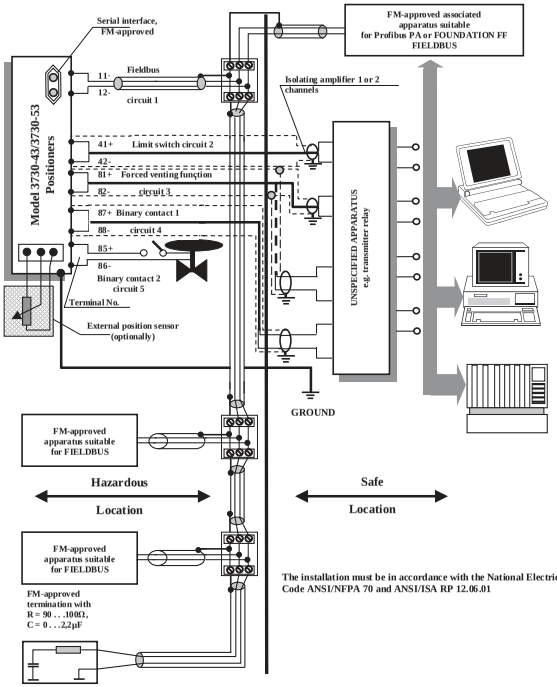
Temperature class	Permissble ambient temperature range
T6	+60°C
T5	-40°C ≤ T_a ≤+70°C
T4	+80°C

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	

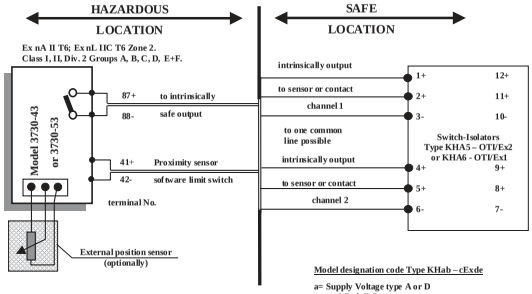
FM approved for hazardous locations:
Ex nA II T6; Ex nL IIC T6 Zone 2.
Class I, II, Div. 2 Groups A, B, C, D, E+F.

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/; 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

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]	Vmax [V]	Rmin [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	↓	↓	↓	↓

SMART IN FLOW CONTROL

SAMSON

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Elektropneumatischer Stellungsregler mit PROFIBUS-PA-Kommunikation /
Electropneumatic Positioner with PROFIBUS-PA communication /
Positionneur électropneumatique avec communication PROFIBUS-PA
Typ / Type / Type 3730-4...

wird die Konformität mit den einschlägigen Harmonisierungsrechtsvorschriften der Union bestätigt /
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EMC 2014/30/EU	EN 61000-6-2:2005, EN 61000-6-3:2007 +A1:2011, EN 61326-1:2013
RoHS 2011/65/EU	EN 50581:2012

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Frankfurt / Francfort, 2017-07-29

Im Namen des Herstellers/ On behalf of the Manufacturer/ Au nom du fabricant.

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Responsable de l'assurance de la qualité

i.V. Dirk Hoffmann

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Physikalisch Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig
Benannte Stelle/Notified Body/Organisme notifié 0102

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Typ / Type / Type 3730-48..**

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