PROFIBUS-PA Positioner

Type 3785

Application

Single-acting or double-acting PROFIBUS-PA positioner for attachment to pneumatic control valves.

Travels from 5 to 255 mm · Opening angle up to 120°

Smart, bus-powered field device conforming to PROFIBUS-PA specifications based on IEC 61158-2 standard transmission technology. Automatic adaptation to valve and actuator.

The microprocessor-controlled positioner ensures a predetermined assignment of the valve stem position to the control signal. It compares the digital control signal received from a control system via bus lines (cyclic transmission) with the travel of a control valve and produces the corresponding pneumatic output signal pressure.

Suitable for attachment to both linear and rotary actuators.

The Type 3785 PROFIBUS-PA Positioner communicates according to PROFIBUS-PA Profile Class B based on DIN EN 50170 and DIN 19245 Part 4, thus exchanging data with suitable programmable logic controllers, automation systems and various computer based configuration and operating tools.

Positioners featuring digital data processing benefit from the following advantages compared to conventional positioners without such capabilities:

- Easy operation, automatic adjustment of zero and span during positioner initialization
- Automatic detection of faults in the actuator
- Direction of action selectable independent of the mounting position via software functions
- Configurable tight-closing function for both final positions
- Selectable characteristics
- Configurable with a PC over SSP serial interface using TROVIS-VIEW software
- Simple modification of control parameters, even when being operated
- Monitoring and diagnostic functions
- Continuous monitoring of the zero point
- Minimum air consumption
- Permanent storage of all parameters in non-volatile EEPROM (protection against power failure)

Accessories

The digital positioner's functions can be optionally extended through the following equipment:

– Two inductive limit switches (proximity switches)

– Forced venting function which, upon absence of an external signal, vents air from the actuator via the 2/2-way on-off valve (Fig. 3, no. 4). As a result, the control valve moves to its fail-safe position.

Fig. 1 · Type 3785 PROFIBUS-PA Positioner

Fig. 2 · Type 3785 Positioner with open cover

Principle of operation

The travel of the final control element is detected via the non-contact inductive travel sensor (1) and transmitted to the microcontroller (2) via converter. In the microcontroller, the travel is compared to the set point, and the two pneumatic 2/2-way on-off valves (3, 4) are activated whenever a deviation (error) occurs.

Depending on the error, these valves either supply air to (3) or vent air from (4) the pneumatic actuator via corresponding boosters.

A second microcontroller (5) manages digital data transmission according to PROFIBUS-PA Profile Class B definition. The positioner communicates and is powered via IEC 61158-2 standard transmission technology.

LEDs integrated inside the positioner's cover signalize readiness for operation, control operation and any operational faults.

A software package enables tuning and selection of all the required parameters which are downloaded to the PROFIBUS-PA positioner by the program. Frame applications that support the FDT/DTM technology according to specification 2.1 (e.g. PACTware) are suitable. Other integration options (e.g. in COMMUWIN II or PDM) are available.

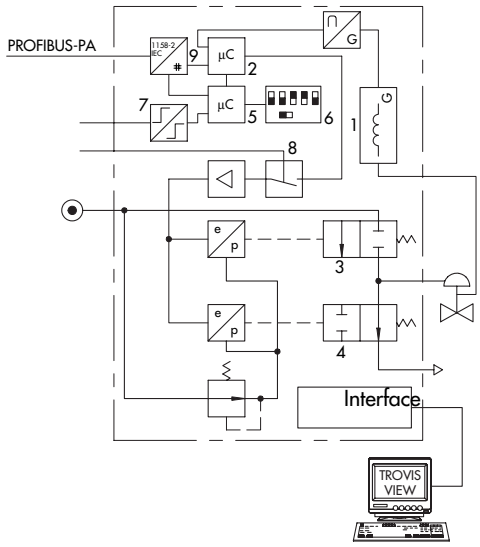
As a standard feature, the PROFIBUS-PA positioner comes with a binary input used to signalize additional alarms.

A write protection switch located on the inside of the cover prevents saved configurations from being overwritten unintentionally.

Configuration with TROVIS-VIEW software

The positioner must be connected to a DC voltage source for a reliable operating voltage supply, however, not an active bus segment.

An additional digital interface exists on the positioner to configure it using SAMSON's TROVIS-VIEW software which is connected with to RS-232 port of a PC. The TROVIS-VIEW software enables the positioner to be adapted to the process requirements and the process to be monitored online.



Legend

1 Inductive travel sensor
2 Microcontroller
3 On-off valve for supply air
4 On-off valve for venting air
5 Microcontroller
6 Microswitch for bus address and write protection
7 Binary input
8 Forced venting
9 IEC 61158-2 Interface module

Fig. 3 · Functional diagram of Type 3785 PROFIBUS-PA Positioner

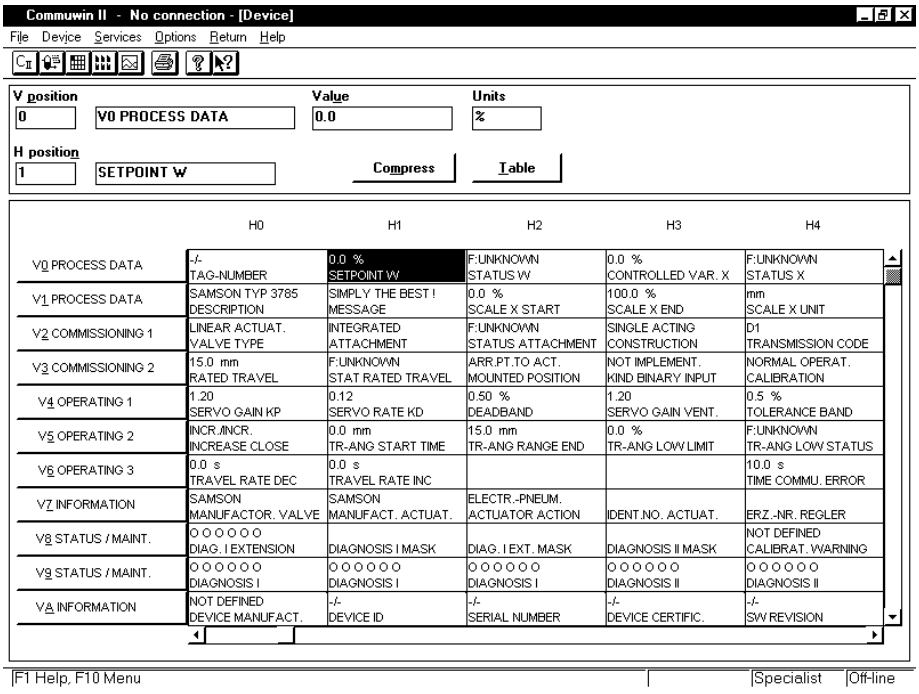


Fig. 4 · Display of parameters by means of the COMMUWIN II program package

Table 1 · Technical data for Type 3785

Travel Attachment to Type 3277 Actuator Attachment acc. to IEC 60534-6 (NAMUR)		**Adjustable** 5 to 30 mm 5 to 255 mm or 30 to 120° for rotary actuators
Bus connection		Fieldbus interface according to IEC 61158-2 Field device according to FISCO (Fieldbus intrinsically safe concept)
Permissible operating voltage		9 to 32 V DC · Static destruction limit 35 V · Power supply via bus cable Limits in the EC Type Examination Certificate additionally apply for explosion-protected devices.
Maximum operating current		10 mA
Maximum current in case of fault		0 mA
Supply air		1.4 to 6 bar (20 to 90 psi)
	Air quality acc. to ISO 8573-1(2001)	Maximum particle size and density: Class 4 · Oil contents: Class 3 Pressure dew point: Class 3 or at least 10 K below the lowest expected ambient temperature
Output signal pressure		0 bar to capacity of supply air
Characteristic	Adjustable	Linear · Equal percentage · Reverse equal percentage · User programmable
	Deviation	< 1 %
Dead band (based on rated travel/angle)		Adjustable from 0.1 to 10.0 % · Default 0.5 %
Resolution (internal measurement)		< 0.05 %
Transit time to travel		Up to 75 s, separately adjustable for exhaust and supply air
Moving direction		Reversible · Adjustment via software
Air consumption		Independent of supply air < 90 l_n/h
Air output capacity	Actuator filled	For Δp = 6 bar: 9.3 m_n^3/h · For Δp = 1.4 bar: 3.5 m_n^3/h
	Actuator vented	For Δp = 6 bar: 15.5 m_n^3/h · For Δp = 1.4 bar: 5.8 m_n^3/h
Permissible ambient temperature		–40 to 80 °C The limits in EC Type Examination Certificate additionally apply for explosion-protected devices.
Effects	Temperature	≤ 0.15 %/10 K
	Auxiliary power	None
	Vibrations	None up to 250 Hz and 4 g
Explosion protection		⟨Ex⟩ II 2 G EEx ia IIC/IIB T6 or ⟨Ex⟩ II 2 D IP 65 T 80 °C, other approvals on page 4
Degree of protection		IP 65 by using supplied filter check valve
Electromagnetic compatibility		Complies with EN 61000-6-2, EN 61000-6-3 and NAMUR recommendation 21 requirements
Binary input		Internal power supply 5 V DC · R_i approx. 100 kΩ for signaling function
Electrical connections		One M20 x 1.5 cable gland for 7 to 12 mm clamping range · Second M20 x 1.5 threaded connection additionally exists · Screw terminals for 0.2 to 2.5 mm^2 wire cross-sections
Forced venting	Input	0 to 40 V DC/0 to 28 V AC, static destruction limit 45 V DC/32 V AC, input resistance ≥ 7 kΩ
	Signal	Fail-safe position at input voltage ≤ 3 V · Normal operation at input voltage > 5 V
Weight		Approx. 1.3 kg
Communication		
Data transmission		According to PROFIBUS-PA · Profile Class B according to EN 50 170 and DIN 19 245 Part 4
Communication (local)		SAMSON SSP interface and serial interface adapter
Software requirements		TROVIS-VIEW with database module 3785
Communication over fieldbus		DTM file according to specification 1.2, suitable for integrating the positioner into frame applications that support the FDT/DTM concept (e.g. PACTware) other integrations (e.g. in COMMUWIN II or PDM) are available
Additional equipment		
Inductive limit switches		For connection to a NAMUR signal converter according to EN 60 947-5-6 Two Type SJ2-SN Proximity switches

Table 2 · Materials

Housing	Die-cast aluminum, chromated and plastic-coated
External parts	Stainless steel 1.4571 and 1.4301
Cable gland	Nickel-plated brass

Table 3 · Summary of explosion protection certificates for Type 3785

Type of approval	Certificate number	Date	Comments
EC Type Examination Certificate First Addendum Second Addendum Third Addendum	PTB 97 ATEX 2254	1997-12-10 1999-07-23 2002-02-19 2004-01-14	⟨Ex⟩ II 2 G EEx ia IIC T6 (3.3-volt version) with programming connector ⟨Ex⟩ II 2 D IP 65 T 80 °C, Zone 21; Type 3785-1
FMRC approval	3001089 ID. 3013663	1999-01-27 2002-08-28	Cl. I, II, III; Div 1; Groups A to G; NEMA Type 4 X Cl. I, Zone 0, AEx ia IIC T6; Cl. I, Div. 2, Gr. A to D; Type 3785-3
CSA approval	1001210 1330128	2000-08-18 2003-06-09	Class I, Div. 1; Gr. A, B, C, D; Cl. I, Zone 0, Ex ia IIC T6, Type 4 Enclosure / Rev. logic board; Type 3785-3
GOST approval	2002.C299	2002-12-26	1 Ex ia IIC T6, valid until 2008-01-01; Type 3785-1

The EC Type Examination Certificate is included in the Mounting and Operating Instructions or is available on request.

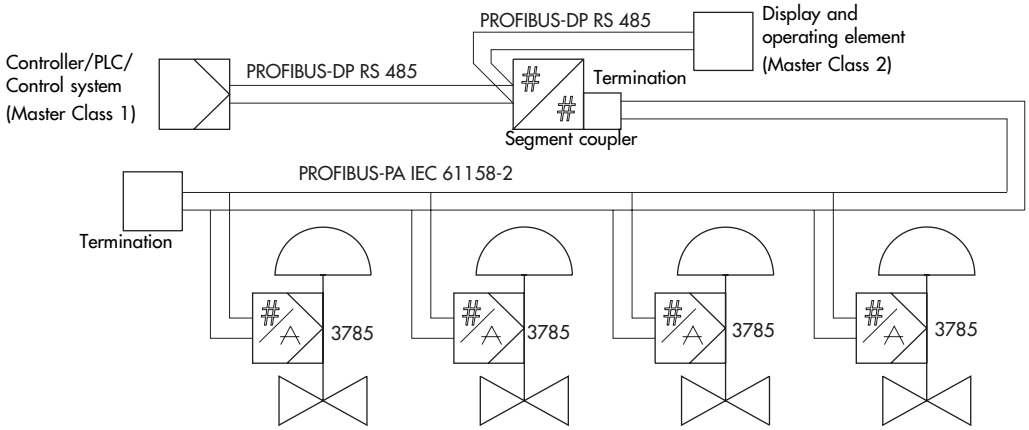


Fig. 5 · PROFIBUS connection of the Type 3785 Positioner

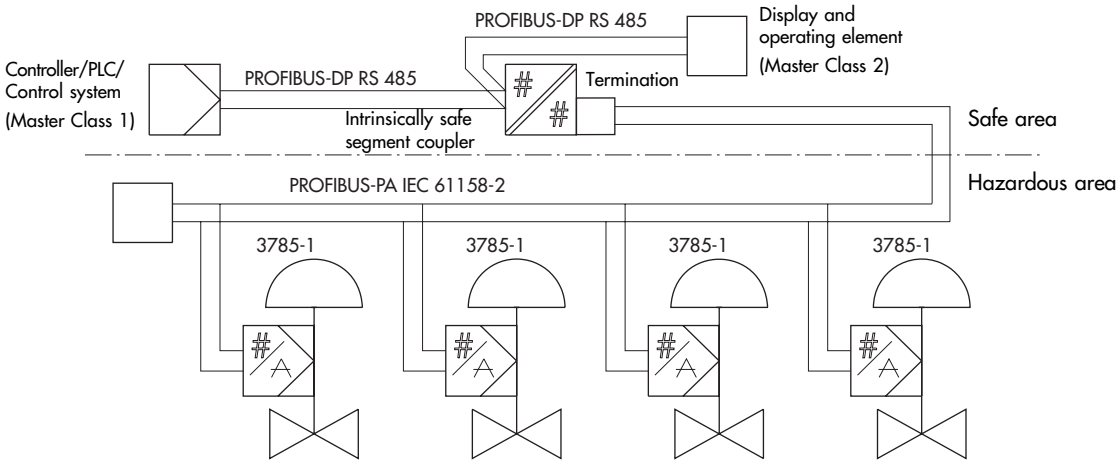
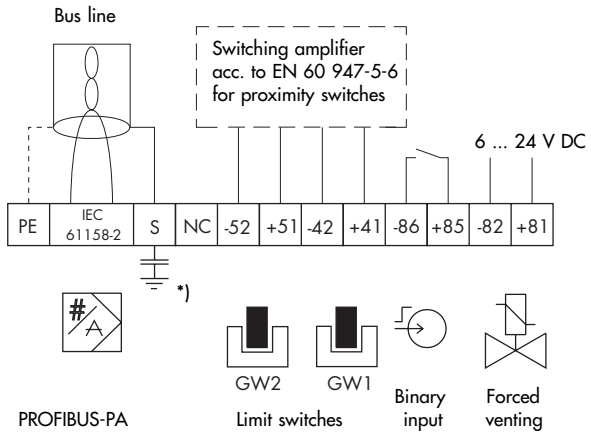


Fig. 6 · Connection of the Type 3785-1 Positioner in hazardous areas

Connecting the PROFIBUS-PA Positioner

The Type 3785 PROFIBUS-PA Positioner must be connected to bus segments conforming to IEC 61158-2 standard. Power supply as well as data communication take place via a shielded or unshielded two-wire cable.

Electrical connection



*) Capacitive grounding of the shield

Fig. 7 · Electrical connection of Type 3785 with accessories

A segment coupler serves to provide the individual PROFIBUS-PA segments with energy. If PROFIBUS-PA segments are used in hazardous areas, explosion-protected segment couplers must be used.

Attaching the digital positioner

The digital Type 3785 Positioner can be mounted directly to the Type 3277 Pneumatic Actuator using a connection block. For actuator versions with fail-safe action "Actuator stem extends" and Type 3277-5 (120 cm^2), the signal pressure is internally routed to the diaphragm chamber through a hole integrated into the actuator yoke. For actuator versions with fail-safe action "Actuator stem retracts" and for actuators with effective areas of 240 cm^2 or larger, the signal pressure is routed to the diaphragm chamber over ready-made external piping.

An adapter plate allows the positioner to be attached to either side of the control valve according to IEC 60534 (NAMUR recommendation).

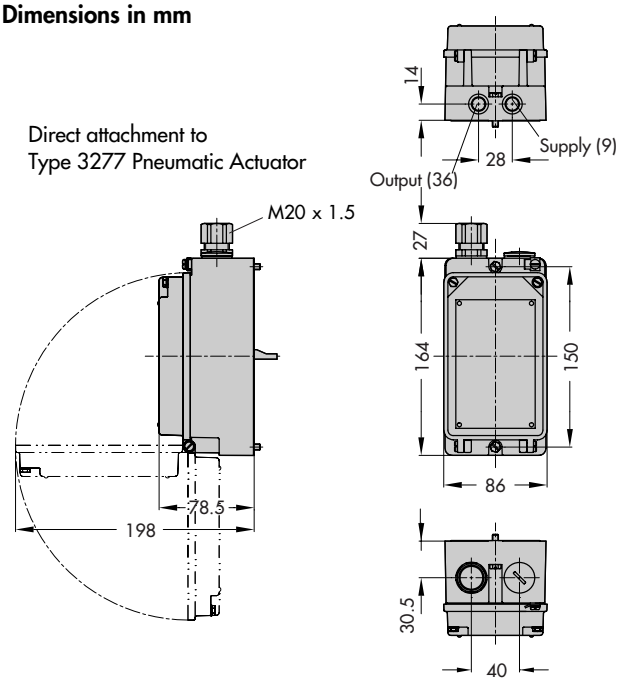
Attachment to the Type 3278 Pneumatic Rotary Actuator or other rotary actuators according to VDI/VDE 3845 requires an intermediate piece. The rotary motion of the actuator is converted into a linear motion by a cam disk. This cam disk is designed for an angle of either 0 to 90° or 0 to 120°. The characteristic can be selected via software. For double-acting springless actuators, a reversing amplifier is required for the second opposed signal pressure.

Article code

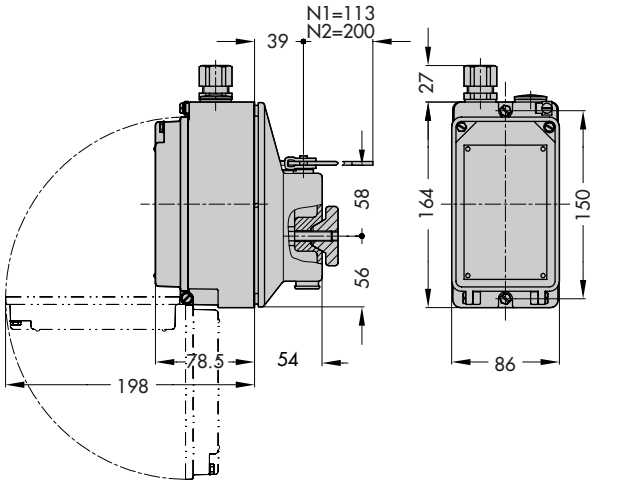
Positioner	Type 3785-	x	x	x	x	x	3	x	0	0	0	0	0
Explosion protection													
Without		0											
⟨Ex⟩ II 2 G EEx ia IIC T6 ,⟨Ex⟩ II 2 D IP 65 T 80 °C acc. to ATEX		1											
FM/CSA Ex ia		3											
Limit switches													
Without			0										
2 x Inductive			2					2					
Forced venting													
Without				0									
With				1				2					
PA device profile													
Version 2.0					0								
Version 3.0					1								
Pneumatic connections													
¼-18 NPT						1							
ISO 228/1 - G ¼						2							
Electrical connections													
1 x M20 x 1.5 metal cable gland with shielding								1					
2 x M20 x 1.5 metal cable glands with shielding								2					

Dimensions in mm

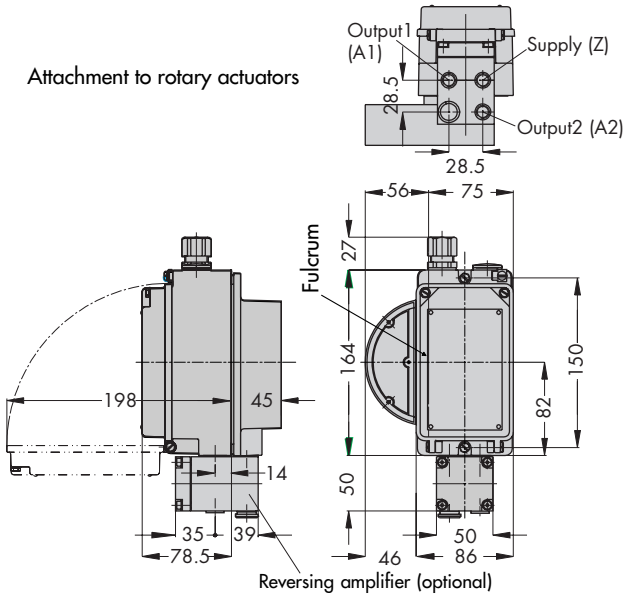
Direct attachment to
Type 3277 Pneumatic Actuator



Attachment according to
IEC 60534 and NAMUR



Attachment to rotary actuators



Ordering text

PROFIBUS-PA Positioner Type 3785-..... (see article code)
Pressure gauge for signal pressure Without/with
For positioners with limit switches:
Metal tag in final position of the valve outside active zone
Metal tag in final position of the valve inside active zone
Attachment to Type 3277:
Actuator sizes 120/240/350/700 cm^2,
Fail-safe action:
Actuator stem Extends/retracts
Attachment according to IEC 60534 (NAMUR)
Travel: ... mm
Stem diameter: ... mm (if applicable)
If applicable, signal pressure restrictions for actuators with small travel volumes
Attachment to rotary actuators:
Type 3278, sizes 160/320 cm^2
Attachment to single-acting/double-acting rotary actuators according to VDI/VDE 3845.
If applicable, signal pressure restrictions for actuators with small travel volumes

Accessories: Adapter NPT 1/2 for electrical connections

Specifications subject to change without notice

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