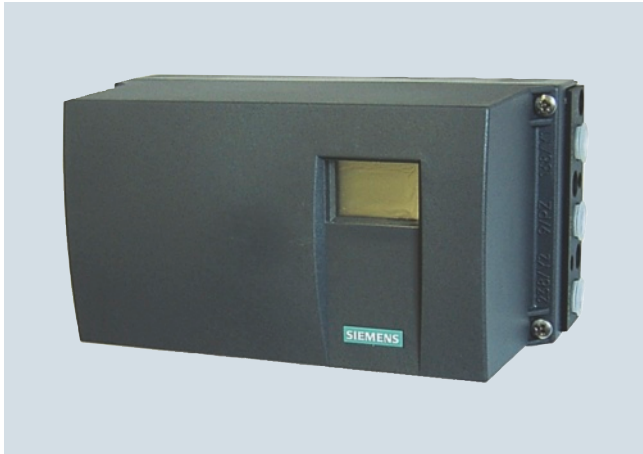


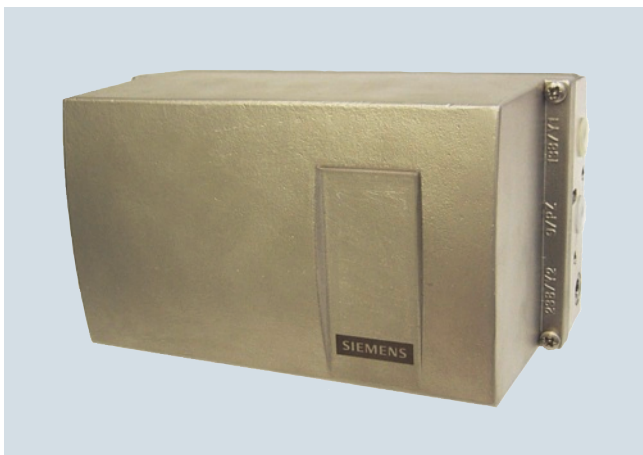
Overview



Electropneumatic positioner SIPART PS2 in the Makrolon enclosure



SIPART PS2 electropneumatic positioner in flameproof aluminum enclosure



SIPART PS2 in stainless steel enclosure

The SIPART PS2 electropneumatic positioner is used to control the final control element of pneumatic linear or part-turn actuators. The electropneumatic positioner moves the actuator to a valve position corresponding to the setpoint. Additional function inputs can be used to block the valve or to set a safety position. A binary input is present as standard in the basic device for this purpose.

Benefits

SIPART PS2 positioners offer decisive advantages:

- Simple installation and automatic commissioning (self-adjustment of zero and span)
- Simple operation with
 - Local operation (manual operation) and configuration of the device using three buttons and a user-friendly two-line display
 - Parameterization via SIMATIC PDM
- Very high-quality control thanks to an online adaptation procedure
- Negligible air consumption in stationary operation
- "Tight closing" function (ensures maximum positioning pressure on the valve seat)
- "Fail in place" function: Current position is retained on electrical power failure (does not apply in conjunction with SIL)
- Numerous functions can be activated by simple configuring (e. g. characteristic curves and limits)
- Extensive diagnostic functions for valve and actuator
- Only one device version for linear and part-turn actuators
- Few moving parts, hence insensitive to vibrations
- External non contacting sensor as option for extreme ambient conditions
- "Intelligent solenoid valve": Partial Stroke Test and solenoid valve function in one device
- Partial Stroke Test e. g. for safety valves
- Full Stroke Test, Multi Step Response Test, Valve Performance Test for performance and maintenance evaluation of the valve
- Can also be operated with purified natural gas, carbon dioxide, nitrogen or noble gases
- SIL (Safety Integrity Level) 2

Application

The SIPART PS2 positioner is used, for example, in the following industries:

- Chemical/petrochemical
- Power stations
- Paper and glass
- Water, waste water
- Food and pharmaceuticals
- Offshore plants

The SIPART PS2 positioner is available:

- For single-acting actuators: In Makrolon, stainless steel or aluminum enclosure, as well as flameproof aluminum enclosure
- For double-acting actuators: In Makrolon enclosure, stainless steel enclosure and flameproof aluminum enclosure
- For non-hazardous applications
- For hazardous applications in the versions
 - Intrinsic safety type of protection
 - Flameproof enclosure type of protection
 - Non-sparking type of protection
 - Dust protection by enclosure type of protection

and in the versions:

- With 0/4 ... 20 mA control with/without communication through HART signal
- With PROFIBUS PA communication interface
- With FOUNDATION Fieldbus (FF) communications interface

Positioners

SIPART PS2

Technical description

Explosion-proof versions

- Device with protection type "intrinsic safety" for use in Zone 1, 2, 21, 22 or Class I, II, III/Division 1/Groups A-G
- Device with protection type "dust protection with enclosure" for use in Zone 21, 22 or Class II, III/Division 1/Groups E-G
- Device with protection type "non-sparking" for use in Zone 2 or Class I, Division 2, Groups A-D
- Device with protection type "flameproof enclosure" for use in Zone 1 or Class I, Division 1, Groups A-D

Stainless steel enclosure for extreme ambient conditions

The SIPART PS2 is available in a stainless steel enclosure (with no window in the cover) for use in particularly aggressive environments (e.g. offshore operation, chlorine plants etc.). The device functions are the same as for the basic version.

Design

The SIPART PS2 positioner is a digital field device with a highly-integrated microcontroller.

The positioner consists of the following components:

- Enclosure and cover
- PCB with corresponding electronics with or without communication through HART 7 or with electronics for communication in accordance with - PROFIBUS PA specification, IEC 61158-2; bus-supplied device, or - FOUNDATION Fieldbus (FF) specification, IEC 61158-2, bus-supplied device
- Position detection system
- Terminal housing with screw terminals
- Pneumatic valve manifold with piezoelectric valve precontrol.

The valve manifold is located in the housing, the pneumatic connections for the inlet air and the positioning pressure on the right-hand side. A pressure gauge block and/or a safety solenoid valve can be connected there as options. The SIPART PS2 positioner is fitted to the linear or part-turn actuator using an appropriate mounting kit. The circuit board container in the casing provides slots for separately ordered boards with the following functions:

Position feedback module

- Position feedback as a two-wire signal 4 to 20 mA

Alarm module (3 outputs, 1 input)

- Signaling of two limits of the travel or angle by binary signals. The two limits can be set independently as maximum or minimum values.
- Output of an alarm if the setpoint position of the final control element is not reached in automatic mode or if a device fault occurs.
- Second binary input for alarm signals of for triggering safety reactions, e. g. blocking function or safety position.

Limit signaling through slot-type initiators (SIA module)

Two limits can be signaled redundantly as NAMUR signals (EN 60947-5-6) by slot-type initiators. An alarm output is also integrated in the module (see "Alarm Module").

Limit value signal via mechanical contacts (mechanical limit switch module)

Two limits can be signaled redundantly by switching contacts. An alarm output is also integrated in the module (see "Alarm Module").

Valid for all modules described above:

All signals are electrically isolated from one another and from the basic unit. The outputs indicate self-signaling faults. The modules are easy to retrofit.

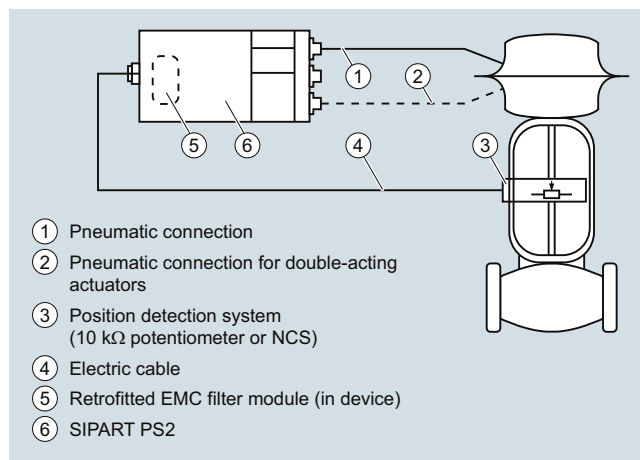
Separate mounting of position detection system and controller unit

The position detection system and controller unit can be connected separately for all casing versions of the SIPART PS2 (except flameproof design). Measurement of the travel or angle is carried out directly on the actuator. The controller unit can then be fitted a certain distance away, e. g. on a mounting pipe or similar, and is connected to the position detection system by an electric cable and to the actuator by one or two pneumatic lines. Such a split design is frequently advantageous if the ambient conditions at the fitting exceed the specified values for the positioner (e. g. strong vibrations).

The following can be used for measuring the travel or angle:

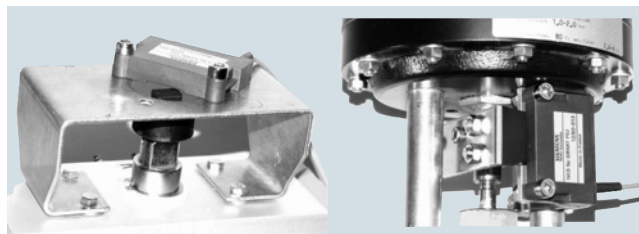
- NCS sensor
- External position detection system C73451-A430-D78
- A commercially available potentiometer (10 kΩ resistance), e. g. for higher application temperatures or customer-specific applications

The use of potentiometers is recommended for very small linear actuators with a short valve travel since, on the one hand, the space required by the potentiometer is very small and, on the other, the transmission characteristic is optimum for a small travel.



Separate mounting of position detection system and controller unit

Non contacting sensor (NCS)



NCS for part-turn actuator (6DR4004-N.10) mounted with mounting console (left) and NCS for linear actuator ≤ 14 mm (0.55 inch) (6DR4004-N.20) mounted with actuator-specific mounting solution (right)

Positioners

SIPART PS2

Technical specifications

Technical specifications

SIPART PS2 (all versions)

Rated conditions		Design	
Ambient conditions	For indoor and outdoor use	• Outlet air valve (deerate actuator for fail in place version)	
Ambient temperature	In hazardous areas, observe the maximum permitted ambient temperature according to the temperature class. See "Technical Specifications" on page 5/9.	- 2 bar (29 psi)	4.3 Nm ³ /h (19.0 USgpm)
• Permitted ambient temperature for operation ¹⁾	-30 ... +80 °C (-22 ... +176 °F)	- 4 bar (58 psi)	7.3 Nm ³ /h (32.2 USgpm)
• Altitude	2 000 m above sea level. At altitudes greater than 2 000 m above sea level, use a suitable power supply.	- 6 bar (87 psi)	9.8 Nm ³ /h (43.3 USgpm)
• Relative humidity	0 ... 100 %	Valve leakage	< 6 · 10 ⁻⁴ Nm ³ /h (0.0026 USgpm)
Degree of protection ²⁾	IP66 according to IEC/EN 60529/NEMA 4X	Restrictor ratio	Adjustable up to ∞ : 1
Mounting position	Any; pneumatic connections and exhaust opening not facing up in wet environment	Auxiliary power consumption in the controlled state	< 3,6 · 10 ⁻² Nm ³ /h (0.158 USgpm)
Vibration resistance		Sound pressure	L _{Aeq} < 75 dB L _{Amax} < 80 dB
• Harmonic oscillations (sine-wave) according to EN 60068-2-6/10.2008	3.5 mm (0.14"), 2 ... 27 Hz, 3 cycles/axis 98.1 m/s ² (321.84 ft/s ²), 27 ... 300 Hz, 3 cycles/axis	Design	
• Bumping (half-sine) according to EN 60068-2-27/02.2010	150 m/s ² (492 ft/s ²), 6 ms, 1000 shocks/axis	Mode of operation	
• Noise (digitally controlled) according to EN 60068-2-64/04.2009	10 ... 200 Hz; 1 (m/s ²) ² /Hz (3.28 (ft/s ²) ² /Hz) 200 ... 500 Hz; 0.3 (m/s ²) ² /Hz (0.98 (ft/s ²) ² /Hz) 4 hours/axis	• Range of stroke (linear actuators)	3 ... 130 mm (0.12 ... 5.12 inch) (angle of positioner shaft 16 ... 90°) Larger range of stroke on request.
• Recommended continuous duty range of the complete fitting	≤ 30 m/s ² (98.4 ft/s ²) without resonance sharpness	• Angle of rotation range (part-turn actuators)	30 ... 100°
Climatic class	According to EN 60721-3-4	Mounting type	
• Storage	1K5, but -40 ... +80 °C (1K5, but -40 ... +176 °F)	• On linear actuators	Using mounting kit 6DR4004-8V and where necessary with an additional lever arm 6DR4004-8L on actuators according to IEC 60534-6-1 (NAMUR) with ribs, bars or flat face.
• Transport	2K4, but -40 ... +80 °C (2K4, but -40 ... +176 °F)	• On part-turn actuators	Using mounting kit 6DR4004-8D on actuators with mounting plane according to VDI/VDE 3845 and IEC 60534-6-2.
• Operation ¹⁾³⁾⁴⁾	4K3, but -30 ... +80 °C (4K3, but -22 ... +176 °F) ³⁾	Weight, positioner without option modules or accessories	
Pneumatic data		• 6DR5..0 Glass-fiber reinforced enclosure made from polycarbonate	Approx. 0.9 kg (1.98 lb)
Auxiliary power (air supply)	Compressed air, carbon dioxide (CO ₂), nitrogen (N), noble gases or cleaned natural gas	• 6DR5..1 Aluminum enclosure, narrow	Approx. 1.3 kg (2.86 lb)
• Pressure ⁵⁾	1.4 ... 7 bar (20.3 ... 101.5 psi)	• 6DR5..2 Stainless steel enclosure	Approx. 3.9 kg (8.6 lb)
Air quality to ISO 8573-1		• 6DR5..3 Aluminum enclosure	Approx. 1.6 kg (3.53 lb)
• Solid particulate size and density	Class 2	• 6DR5..5 Flameproof aluminum enclosure	Approx. 5.2 kg (11.46 lb)
• Pressure dew point	Class 2 (min. 20 K (36 °F) below ambient temperature)	Material	
• Oil content	Class 2	• Enclosure	
Unrestricted flow (DIN 1945)		- 6DR5..0 Makrolon	Glass-fiber reinforced polycarbonate (PC)
• Inlet air valve (ventilate actuator) ⁶⁾		- 6DR5..1 Aluminum, narrow	GD AISi12
- 2 bar (29 psi)	4.1 Nm ³ /h (18.1 USgpm)	- 6DR5..2 Stainless steel	Austenitic stainless steel 316Cb, mat. No. 1.4581
- 4 bar (58 psi)	7.1 Nm ³ /h (31.3 USgpm)	- 6DR5..3 Aluminum	GD AISi12
- 6 bar (87 psi)	9.8 Nm ³ /h (43.1 USgpm)	- 6DR5..5 Aluminum, flameproof	GK AISi12
• Outlet air valve (deerate actuator for all versions except fail in place) ⁶⁾		• Pressure gauge block	Aluminum AIMgSi, anodized
- 2 bar (29 psi)	8.2 Nm ³ /h (36.1 USgpm)	Dimensions	See "Dimensional Drawings" on page 5/22
- 4 bar (58 psi)	13.7 Nm ³ /h (60.3 USgpm)	Device versions	
- 6 bar (87 psi)	19.2 Nm ³ /h (84.5 USgpm)	• In Makrolon enclosure 6DR5..0	Single-acting and double-acting
		• In aluminum enclosure 6DR5..1	Single-acting
		• In aluminum enclosure 6DR5..3 and 6DR5..5	Single-acting and double-acting
		• In stainless steel enclosure 6DR5..2	Single-acting and double-acting

Gauge	
• Degree of protection	
- Gauge made of plastic	IP31
- Gauge made of steel	IP44
- Gauge made of stainless steel 316	IP54
• Vibration resistance	According to EN 837-1
Connections, electrical	
• Screw terminals	2.5 mm ² AWG30-14
• Cable gland	
- Without explosion protection as well as with Ex i	M20x1.5 or ½-14 NPT
- With explosion protection Ex d	Ex d certified M20x1.5; ½-14 NPT or M25x1.5
Connections, pneumatic	Female thread G¼ or ¼-18 NPT

Controller	
Controller unit	
• Five-point switch	Self-adjusting
• Deadband	
- dEbA = Auto	Self-adjusting
- dEbA = 0.1 ... 10 %	Can be set as fixed value
Analog-to-digital converter	
• Scan time	10 ms
• Resolution	≤ 0,05 %
• Transmission error	≤ 0,2 %
• Temperature influence effect	≤ 0.1 %/10 K (≤ 0.1 %/18 °F)

Certificates and approvals	
Classification according to pressure equipment directive (PED 97/23/EC)	For gases of fluid group 1, complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)
CE conformity	You can find the appropriate directives and standards, including the relevant versions, in the EC Declaration of Conformity on the Internet.

Explosion protection	
Explosion protection according to ATEX/IECEx	
• Flameproof enclosure "d"	II 2 G Ex d IIC T6/T4 Gb
• Intrinsic safety "i"	II 2 G Ex ia IIC T6/T4 Gb II 3 G Ex ic IIC T6/T4 Gc II 2 D Ex ia IIIC T110°C Db
• Non-sparking "nA"	II 3 G Ex nA IIC T6/T4 Gc
• Dust, protection with "t" enclosure ⁷⁾	II 2 D Ex tb IIIC T100°C Db
Explosion protection according to FM/CSA, suitable for installations according to NEC 500/NEC 505	
• Flameproof enclosure "XP"	XP, Class I, Division 1, Gr. ABCD XP, Class I, Zone 1, AEx d, IIC, T6/T4
• Intrinsic safety "IS"	IS / I, II, III / 1 / A-G IS / 1 / AEx / Ex ib / IIC, Gb IS / 21 / AEx / Ex ib / IIIC, Db, T110°C
• Non-sparking "NI"	NI / 1 / 2 / A-D NI / 2 / AEx / Ex nA, Ex ic / IIC, Gc
• Dust, protection with "DIP" enclosure ⁷⁾	DIP / II, III / 1 / E-G DIP / 21 / AEx / Ex tb / IIIC, Db, T100°C

Permissible ambient temperature	
For operation with and without HART ¹⁾³⁾	
• 6DR501./6DR502./6DR521./6DR522.	T4: -30 ... +80 °C (-22 ... +176 °F) T6: -30 ... +50 °C (-22 ... +122 °F)
• 6DR5.15/6DR5.25	T4: -30 ... +80 °C (-22 ... +176 °F) T6: -30 ... +50 °C (-22 ... +122 °F)
For operation with PROFIBUS PA or with FOUNDATION Fieldbus ¹⁾³⁾	
• 6DR551./6DR552./6DR561./6DR562.	T4: -20 ... +75 °C (-4 ... +167 °F) T6: -20 ... +50 °C (-4 ... +122 °F)
• 6DR5515/6DR5525/6DR5615/6DR5625	T4: -30 ... +80 °C (-22 ... +176 °F) T6: -30 ... +50 °C (-22 ... +122 °F)
Natural gas as driving medium	For technical specifications using natural gas as driving medium, see operating instructions.

- 1) The following applies to fail in place:
Without explosion protection: -20 ... +60 °C (-4 ... +140 °F)
With explosion protection:
T4: -20 ... +60 °C (-4 ... +140 °F)
T6: -20 ... +50 °C (-4 ... +122 °F)
- 2) Max. impact energy 1 Joule for enclosure with inspection window 6DR5..0 and 6DR5..1 or max. 2 Joule for 6DR5..3.
- 3) At ≤ -10 °C (≤ 14 °F) the display refresh rate of the indicator is limited. When using position feedback module, only T4 is permitted.
- 4) -20 ... +80 °C (-4 ... +176 °F) for 6DR55..0G..., 6DR56..0G..., 6DR55..0D... and 6DR56..0D...
- 5) The following applies to fail in place: 3 ... 7 bar (43.5 ... 101.5 psi).
- 6) With Ex d version (6DR5..5-...) values are reduced by approx. 20 %.
- 7) For aluminum enclosure, narrow, single-acting, without inspection window 6DR5..1-.D...-.A.-Z...
For stainless steel enclosure, 6DR5..2-.D...-.A.-Z...
For aluminum enclosure, with inspection window 6DR5..3-.K...-.A.-Z...

Positioners

SIPART PS2

Technical specifications

SIPART PS2 with and without HART

	Basic device without Ex protection	Basic device with Ex d explosion protection	Basic device with "ia" explosion protection	Basic device with explosion protection "ic", "nA", "t"
Electrical specifications				
Current input I_W				
• Rated signal range			0/4 ... 20 mA	
• Test voltage			840 V DC, 1 s	
• Binary input BE1 (terminals 9/10; electrically connected to the basic device)		Suitable only for floating contact; max. contact load < 5 μ A at 3 V		
2-wire connection (terminals 6/8) 6DR50.. and 6DR53.. without HART 6DR51.. and 6DR52.. with HART				
Current to maintain the auxiliary power supply		≥ 3.6 mA		
Required load voltage U_B (corresponds to Ω at 20mA)				
• Without HART (6DR50..)				
- Typical	6.36 V (= 318 Ω)	6.36 V (= 318 Ω)	7.8 V (= 390 Ω)	7.8 V (= 390 Ω)
- max.	6.48 V (= 324 Ω)	6.48 V (= 324 Ω)	8.3 V (= 415 Ω)	8.3 V (= 415 Ω)
• Without HART (6DR53..)				
- Typical	7.9 V (= 395 Ω)	-	-	-
- max.	8.4 V (= 420 Ω)	-	-	-
• With HART (6DR51..)				
- Typical	6.6 V (= 330 Ω)	6.6 V (= 330 Ω)	-	-
- max.	6.72 V (= 336 Ω)	6.72 V (= 336 Ω)	-	-
• With HART (6DR52..)				
- Typical	-	8.4 V (= 420 Ω)	8.4 V (= 420 Ω)	8.4 V (= 420 Ω)
- max.	-	8.8 V (= 440 Ω)	8.8 V (= 440 Ω)	8.8 V (= 440 Ω)
• Static destruction limit	± 40 mA	± 40 mA	-	-
Effective internal capacitance C_i				
• Without HART	-	-	11 nF	"ic": 11 nF
• With HART	-	-	11 nF	"ic": 11 nF
Effective internal inductance L_i				
• Without HART	-	-	207 μ H	"ic": 207 μ H
• With HART	-	-	310 μ H	"ic": 310 μ H
For connecting to circuits with the following peak values	-	-	$U_i = 30$ V $I_i = 100$ mA $P_i = 1$ W	"ic": $U_i = 30$ V $I_i = 100$ mA "nA"/"t": $U_n \leq 30$ V $I_n \leq 100$ mA
3-/4-wire connection (terminals 2/4 and 6/8) 6DR52.. with HART, explosion-protected 6DR53.. without HART, not explosion-protected)				
Load voltage at 20 mA	≤ 0.2 V (= 10 Ω)	≤ 0.2 V (= 10 Ω)	≤ 1 V (= 50 Ω)	≤ 1 V (= 50 Ω)
Power supply U_H	18 ... 35 V DC	18 ... 35 V DC	18 ... 30 V DC	18 ... 30 V DC
Current consumption I_H			$(U_H - 7.5 \text{ V})/2.4 \text{ k}\Omega$ [mA]	
Effective internal capacitance C_i	-	-	22 nF	"ic": 22 nF
Effective internal inductance L_i	-	-	0.12 mH	"ic": 0,12 mH
For connecting to circuits with the following peak values	-	-	$U_i = 30$ V DC $I_i = 100$ mA $P_i = 1$ W	"ic": $U_i = 30$ V $I_i = 100$ mA "nA"/"t": $U_n \leq 30$ V $I_n \leq 100$ mA
Electrical isolation	between U_H and I_W	between U_H and I_W	between U_H and I_W (2 intrinsically safe circuits)	between U_H and I_W
HART communication				
HART version			7	
PC parameterization software	SIMATIC PDM; supports all device objects. The software is not included in the scope of delivery.			

SIPART PS2 with PROFIBUS PA/with FOUNDATION Fieldbus

	Basic device without Ex protection	Basic device with Ex d explosion protection	Basic device with "ia" explosion protection	Basic device with explosion protection "ic", "nA", "t"
Electrical specifications				
<u>Power supply, bus circuit (terminals 6/7)</u>	Bus-supplied			
Bus voltage	9 ... 32 V	9 ... 32 V	9 ... 24 V	9 ... 32 V
For connecting to circuits with the following peak values				
• Bus connection with FISCO supply unit			U _i = 17.5 V I _i = 380 mA P _i = 5.32 W	"ic": U _i = 17.5 V I _i = 570 mA "nA"/"t": U _n ≤ 32 V
• Bus connection with barrier			U _i = 24 V I _i = 250 mA P _i = 1.2 W	"ic": U _i = 32 V "nA"/"t": U _n ≤ 32 V
Effective internal capacitance	-	-	C _i = negligible	C _i = negligible
Effective internal inductance	-	-	L _i = 8 μH	"ic": L _i = 8 μH
Current consumption			11.5 mA ± 10 %	
Additional error signal			0 mA	
<u>Safety shutdown can be activated with coding bridge (terminals 81/82)</u>			electrically isolated from bus circuit and binary input	
• Input resistance			> 20 kΩ	
• Signal state "0" (shutdown active)			0 ... 4.5 V or unconnected	
• Signal state "1" (shutdown not active)			13 ... 30 V	
For connecting to power supply with the following peak values				
• Effective Internal capacitance	-	-	U _i = 30 V I _i = 100 mA P _i = 1 W	"nA": U _n ≤ 30 V I _n ≤ 100 mA "ic": U _i = 30 V I _i = 100 mA C _i = negligibly small
Binary input BE1 for PROFIBUS (terminals 9/10); electrically connected to the bus circuit)			Bridged or connection to switching contact. Suitable only for floating contact; max. contact load < 5 μA at 3 V	
Electrical isolation			Electrical isolation between basic device and the input for safety shutdown, as well as the outputs of the option modules	
• For basic device without Ex protection and for basic device with Ex d			The basic device and the input to the safety shutdown, as well as the outputs of the option modules, are separate, intrinsically safe circuits.	
• For basic device Ex "ia"			Electrical isolation between basic device and the input for safety shutdown, as well as the outputs of the option modules	
• For basic device Ex "ic", "nA", "t"				
Test voltage			840 V DC, 1 s	
PROFIBUS PA communication				
Communication	Layers 1 and +2 according to PROFIBUS PA, transmission technology according to IEC 61158-2; slave function; layer 7 (protocol layer) according to PROFIBUS DP, EN 50170 standard with the extended PROFIBUS functions (all data acyclic, manipulated variable, feedbacks and status also cyclic)			
C2 connections	Four connections to master class 2 are supported; automatic connection setup 60 s after break in communication			
Device profile	PROFIBUS PA profile B, version 3.0, more than 150 objects			
Response time to master message	Typically 10 ms			
Device address	126 (when delivered)			
PC parameterization software	SIMATIC PDM; supports all device objects. The software is not included in the scope of delivery.			

Positioners

SIPART PS2

Technical specifications

	Basic device without Ex protection	Basic device with Ex d explosion protection	Basic device with "ia"explosion protection	Basic device with explo- sion protection "ic", "nA", "t"
FOUNDATION Fieldbus communication				
Communications group and class	According to technical specification of the Fieldbus Foundation for H1 communication			
Function blocks	Group 3, Class 31PS (Publisher Subscriber) 1 Resource Block (RB2) 1 Analog Output Function Block (AO) 1 PID Function Block (PID) 1 Transducer Block (Standard Advanced Positioner Valve)			
Execution times of the blocks	AO: 60 ms PID: 80 ms			
Physical layer profile	123, 511			
FF registration	Tested with ITK 5.0			
Device address	22 (when delivered)			