

Pressure Measurement

Transmitters for general requirements

SITRANS P DS III for absolute pressure (gauge construction)

Technical specifications

SITRANS P DS III series for absolute pressure (gauge construction)				
	HART		PROFIBUS PA and FOUNDATION Fieldbus	
Input				
Measured variable	Absolute pressure			
Spans (infinitely adjustable) or nominal measuring range and max. permissible test pressure	Span	Max. perm. test pressure	Nominal measuring range	Max. perm. test pressure
	0.12 ... 3.6 psi a (8.3 ... 250 mbar a)	87 psi a (6 bar a)	3.6 psi a (250 mbar a)	87 psi a (6 bar a)
	0.62 ... 18.9 psi a (43 ... 1300 mbar a)	145 psi a (10 bar a)	18.9 psi a (1300 mbar a)	145 psi a (10 bar a)
	2.32 ... 72.5 psi a (160 ... 5000 mbar a)	435 psi a (30 bar a)	72.5 psi a (5 bar a)	435 psi a (30 bar a)
	14.5 ... 435 psi a (1 ... 30 bar a)	1450 psi a (100 bar a)	435 psi a (30 bar a)	1450 psi a (100 bar a)
Lower measuring limit				
• Measuring cell with silicone oil filling	0 psi a (0 mbar a)			
Upper measuring limit	100 % of max. span			
Output				
Output signal	4 ... 20 mA		Digital PROFIBUS PA and FOUNDATION Fieldbus signal	
• Lower limit (infinitely adjustable)	3.55 mA, factory preset to 3.84 mA		-	
• Upper limit (infinitely adjustable)	23 mA, factory preset to 20.5 mA or optionally set to 22.0 mA		-	
Load				
• Without HART communication	$R_B \leq (U_H - 10.5 \text{ V})/0.023 \text{ A}$ in Ω , U_H : Power supply in V		-	
• With HART communication	$R_B = 230 \dots 500 \Omega$ (SIMATIC PDM) or $R_B = 230 \dots 1100 \Omega$ (HART Communicator)		-	
Physical bus	-		IEC 61158-2	
Protection against polarity reversal	Protected against short-circuit and polarity reversal. Each connection against the other with max. supply voltage.			
Measuring accuracy	Acc. to EN 60770-1			
Reference conditions (All error data refer always refer to the set span)	Increasing characteristic, start-of-scale value 0 bar, stainless steel seal diaphragm, silicone oil filling, room temperature 25 °C (77 °F)) r: Span ratio (r = max. span / set span)			
Error in measurement and fixed-point setting (including hysteresis and repeatability)				
• Linear characteristic			≤ 0.1 %	
- r ≤ 10	≤ 0.1 %			
- 10 < r ≤ 30	≤ 0.2 %			
Long-term drift (temperature change ± 30 °C (± 54 °F))	≤ (0.1 · r) %/year		≤ 0.1 %/year	
Influence of ambient temperature				
• at -10 ... +60 °C (14 ... 140 °F)	≤ (0.1 · r + 0.2) %		≤ 0.3 %	
• at -40 ... -10 °C and 60 ... 85 °C (-40 ... +14 °F and 140 ... 185 °F)	≤ (0.1 · r + 0.15) %/10 K		≤ 0.25 %/10 K	
Measured Value Resolution	-		3 · 10 ⁻⁵ of nominal measuring range	

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	HART	PROFIBUS PA and FOUNDATION Fieldbus
Rated conditions		
Degree of protection (to EN 60529)	IP65	
Temperature of medium		
• Measuring cell with silicone oil filling	-40 ... +100 °C (-40 ... +212 °F)	
• Measuring cell with inert filling liquid	-20 ... +100 °C (-4 ... +212 °F)	
• In conjunction with dust explosion protection	-20 ... +60 °C (-4 ... +140 °F)	
Ambient conditions		
• Ambient temperature		
- Digital indicator	-30 ... +85 °C (-22 ... +185 °F)	
• Storage temperature	-50 ... +85 °C (-58 ... +185 °F)	
• Climatic class		
- Condensation	Relative humidity 0 ... 100 % Condensation permissible, suitable for use in the tropics	
• Electromagnetic Compatibility		
- Emitted interference and interference immunity	Acc. to EN 61326 and NAMUR NE 21	
Design		
Weight (without options)	≈ 1.5 kg (≈ 3.3 lb)	
Enclosure material	Low-copper die-cast aluminum, GD-AISI 12 or stainless steel precision casting, mat. no. 1.4408	
Wetted parts materials		
• Connection shank	Stainless steel, mat. no. 1.4404/316L or Hastelloy C4, mat. no. 2.4610	
• Oval flange	Stainless steel, mat. no. 1.4404/316L	
• Seal diaphragm	Stainless steel, mat. no. 1.4404/316L or Hastelloy C276, mat. no. 2.4819	
Measuring cell filling	Silicone oil or inert filling liquid (maximum value with oxygen measurement pressure 120 bar a) (1740 psi a) at 60 °C (140 °F))	
Process connection	Connection shank G½B to EN 837-1, female thread ½ -14 NPT or oval flange (PN 160 (MWP 2320 psi a) to DIN 19213 with mounting thread M10 or 7/16-20 UNF to EN 61518	
Material of mounting bracket		
• Steel	Sheet-steel, Mat. No. 1.0330, chrome-plated	
• Stainless steel	Sheet stainless steel, mat. no. 1.4301 (SS 304)	
Power supply U _H		Supplied through bus
Terminal voltage on transmitter	10.5 ... 45 V DC 10.5 ... 30 V DC in intrinsically-safe mode	-
Separate 24 V power supply necessary	-	No
Bus voltage		
• Not Ex	-	9 ... 32 V
• With intrinsically-safe operation	-	9 ... 24 V
Current consumption		
• Basic current (max.)	-	12.5 mA
• Start-up current ≤ basic current	-	Yes
• Max. current in event of fault	-	15.5 mA
Fault disconnection electronics (FDE) available	-	Yes

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HART

PROFIBUS PA and FOUNDATION Fieldbus

Certificates and approvals

Classification according to PED 97/23/EC

For gases of fluid group 1 and liquids of fluid group 1; complies with requirements of article 3, paragraph 3 (sound engineering practice)

Explosion protection

- Intrinsic safety "i"

PTB 99 ATEX 2122

- Marking

Ex II 1/2 G EEx ia/ib IIB/IIC T6

- Permissible ambient temperature

-40 ... +85 °C (-40 ... +185 °F) temperature class T4;
-40 ... +70 °C (-40 ... +158 °F) temperature class T5;
-40 ... +60 °C (-40 ... +140 °F) temperature class T6

- Connection

To certified intrinsically-safe circuits with peak values:
 $U_i = 30 \text{ V}$, $I_i = 100 \text{ mA}$,
 $P_i = 750 \text{ mW}$; $R_i = 300 \Omega$

FISCO supply unit:
 $U_o = 17.5 \text{ V}$, $I_o = 380 \text{ mA}$, $P_o = 5.32 \text{ W}$

Linear barrier:
 $U_o = 24 \text{ V}$, $I_o = 250 \text{ mA}$, $P_o = 1.2 \text{ W}$

- Effective internal inductance/capacitance

$L_i = 0.4 \text{ mH}$, $C_i = 6 \text{ nF}$

$L_i = 7 \mu\text{H}$, $C_i = 1.1 \text{ nF}$

- Explosion-proof "d"

PTB 99 ATEX 1160

- Marking

Ex II 1/2 G EEx d IIC T4/T6

- Permissible ambient temperature

-40 ... +85 °C (-40 ... +185 °F) temperature class T4;
-40 ... +60 °C (-40 ... +140 °F) temperature class T6

- Connection

To circuits with values: $U_H = 10.5 \dots 45 \text{ V DC}$

To circuits with values: $U_H = 9 \dots 32 \text{ V DC}$

- Dust explosion protection for zone 20

PTB 01 ATEX 2055

- Marking

Ex II 1 D IP65 T 120 °C
Ex II 1/2 D IP65 T 120 °C

- Permissible ambient temperature

-40 ... +85 °C (-40 ... +185 °F)

- Max. surface temperature

120 °C (248 °F)

- Connection

To certified intrinsically-safe circuits with peak values:
 $U_i = 30 \text{ V}$, $I_i = 100 \text{ mA}$,
 $P_i = 750 \text{ mW}$, $R_i = 300 \Omega$

FISCO supply unit:
 $U_o = 17.5 \text{ V}$, $I_o = 380 \text{ mA}$, $P_o = 5.32 \text{ W}$

Linear barrier:
 $U_o = 24 \text{ V}$, $I_o = 250 \text{ mA}$, $P_o = 1.2 \text{ W}$

- Effective internal inductance/capacitance

$L_i = 0.4 \text{ mH}$, $C_i = 6 \text{ nF}$

$L_i = 7 \mu\text{H}$, $C_i = 1.1 \text{ nF}$

- Dust explosion protection for zone 21/22

PTB 01 ATEX 2055

- Marking

Ex II 2 D IP65 T 120 °C

- Connection

To circuits with values: $U_H = 10.5 \dots 45 \text{ V DC}$;
 $P_{\max} = 1.2 \text{ W}$

To circuits with values: $U_H = 9 \dots 32 \text{ V DC}$;
 $P_{\max} = 1.2 \text{ W}$

- Type of protection "n" (zone 2)

TÜV 01 ATEX 1696 X

Planned

- Marking

Ex II 3 G EEx nA L IIC T4/T5/T6

-

- Explosion protection acc. to FM

Certificate of Compliance 3008490

- Identification (XP/DIP) or (IS); (NI)

CL I, DIV 1, GP ABCD T4...T6; CL II, DIV 1, GP EFG; CL III; CL I, ZN 0/1 AEx ia IIC T4...T6;
CL I, DIV 2, GP ABCD T4...T6; CL II, DIV 2, GP FG; CL III

- Explosion protection to CSA

Certificate of Compliance 1153651

- Identification (XP/DIP) or (IS)

CL I, DIV 1, GP ABCD T4...T6; CL II, DIV 1, GP EFG; CL III; Ex ia IIC T4...T6; CL I, DIV 2, GP ABCD T4...T6; CL II, DIV 2, GP FG; CL III

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HART communication	
HART communication	230 ... 1100 Ω
Protocol	HART Version 5.x
Software for computer	SIMATIC PDM
PROFIBUS PA communication	
Simultaneous communication with master class 2 (max.)	4
The address can be set using	Configuration tool or local operation (standard setting address 126)
Cyclic data usage	
• Output byte	5 (one measured value) or 10 (two measured values)
• Input byte	0, 1, or 2 (register operating mode and reset function for metering)
Internal preprocessing	
Device profile	PROFIBUS PA Profile for Process Control Devices Version 3.0, Class B
Function blocks	2
• Analog input	
- Adaptation to customer-specific process variables	Yes, linearly rising or falling characteristic
- Electrical damping T_{63} , adjustable	0 to 100 s
- Simulation function	Input /Output
- Failure mode	parameterizable (last good value, substitute value, incorrect value)
- Limit monitoring	Yes, one upper and lower warning limit and one alarm limit respectively
• Register (totalizer)	Can be reset, preset, optional direction of counting, simulation function of register output
- Failure mode	parameterizable (summation with last good value, continuous summation, summation with incorrect value)
- Limit monitoring	One upper and lower warning limit and one alarm limit respectively
• Physical block	1
Transducer blocks	2
• Pressure transducer block	
- Can be calibrated by applying two pressures	Yes
- Monitoring of sensor limits	Yes
- Characterizer	Max. 30 points
- Square-rooted characteristic for flow measurement	Yes
- Gradual volume suppression and implementation point of square-root extraction	Parameterizable
- Simulation function for measured pressure value and sensor temperature	Constant value or over parameterizable ramp function

FOUNDATION Fieldbus communication

Function blocks	3 function blocks analog input, 1 function block PID
• Analog input	
- Adaptation to customer-specific process variables	Yes, linearly rising or falling characteristic
- Electrical damping T_{63} , adjustable	0 ... 100 s
- Simulation function	Output/input (can be locked within the device with a bridge)
- Failure mode	parameterizable (last good value, substitute value, incorrect value)
- Limit monitoring	Yes, one upper and lower warning limit and one alarm limit respectively
- Square-rooted characteristic for flow measurement	Yes
• PID	Standard FF function block
• Physical block	1 resource block
Transducer blocks	1 transducer block Pressure with calibration, 1 transducer block LCD
• Pressure transducer block	
- Can be calibrated by applying two pressures	Yes
- Monitoring of sensor limits	Yes
- Simulation function: Measured pressure value, sensor temperature and electronics temperature	Constant value or over parameterizable ramp function

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Selection and Ordering data		Order No.
Pressure transmitters for absolute pressure aus series pressure, SITRANS P DS III HART		F) 7MF4233 -
Measuring cell filling	Measuring cell cleaning	
Silicone oil	normal	1
Inert liquid ¹⁾	Grease-free	3
Measuring span		
0.12 ... 3.63 psi a	(8.3 ... 250 mbar a)	D
0.62 ... 18.9 psi a	(43 ... 1300 mbar a)	F
2.32 ... 72.5 psi a	(0.16 ... 5 bar a)	G
14.5 ... 435 psi a	(1 ... 30 bar a)	H
Wetted parts materials		
Seal diaphragm	Process connection	
Stainless steel	Stainless steel	F) A
Hastelloy	Stainless steel	F) B
Hastelloy	Hastelloy	F) C
Version for diaphragm seal ²⁾³⁾⁴⁾		Y 1
Process connection		
• Connection shank G½B to EN 837-1		0
• Female thread ½-14 NPT		1
• Stainless steel oval flange		
- Mounting thread 7/16-20 UNF to EN 61518		2
- Mounting thread M10 to DIN 19213		3
- Mounting thread M12 to DIN 19213		4
• Male thread M20 x 1.5		5
• Male thread ½-14 NPT		6
Non-wetted parts materials		
• Housing made of die-cast aluminium		0
• Housing stainless steel precision casting ⁵⁾		3
Version		
• Standard versions		1
• International version, English label inscriptions, documentation in 5 languages on CD		2
Hazardous area rating		
• General purpose		A
• ATEX Hazardous approval		
- "Intrinsically safe (EEx ia)"		B
- "Explosion-proof (EExd)" ⁶⁾		D
- "Intrinsically safe and explosion-proof (EEx ia + EEx d)" ⁷⁾		P
- use in zone 2		E
- "Intrinsically safe, explosion-proof enclosure and dust explosion protection (EEx ia + EEx d + zone 1D/2D)" ⁷⁾		R
• FM/CSA Hazardous approval		
- "Intrinsically Safe und explosion proof (is + xp)" ⁶⁾		NC
Electrical connection / cable entry		
• Screwed gland Pg 13.5 ⁸⁾		A
• Screwed gland M20x1.5		B
• ½-14 NPT		C
• Han 7D plug (plastic housing) incl. mating connector ⁸⁾		D
• M12 connectors (metal) ⁹⁾		F

Selection and Ordering data		Order No.
Pressure transmitters for absolute pressure aus series pressure, SITRANS P DS III HART		F) 7MF4233 -
Indicator		
• Without indicator		0
• Without indicator (digital display hidden, setting: mA)		1
• With indicator (digital display visible, setting: mA)		6
• With indicator (digital display visible, settings as specified, Order Code "Y21"/"Y22" required)		7
Power supply units see Chap. 8 "Supplementary Components".		
Included in delivery of the device:		
• Brief instructions (Leporello)		
• CD-ROM with detailed documentation		
1) For oxygen cleaning application, add Order code E10.		
2) Version 7MF4233-1DY... only up to max. span 200 mbar a (2.9 psi a).		
3) When the manufacture's certificate (calibration certificate) has to be ordered for transmitters with diaphragm seals according to IEC 60770-2, it is recommended only to order this certificate exclusively with the diaphragm seals. The measuring accuracy of the total combination is certified here. If the acceptance test certificate 3.1 is ordered for the transmitter with mounted diaphragm seals this certificate must also be ordered with the respective remote seals.		
4) If the acceptance test certificate 3.1 is ordered for the transmitter with mounted diaphragm seals this certificate must also be ordered with the respective remote seals.		
5) Not in conjunction with Electrical connection "Screwed gland Pg 13.5" and "Han7D plug".		
6) Without cable gland, with blanking plug		
7) With enclosed cable gland EEx ia and blanking plug		
8) Not in conjunction with types of protection "Explosion-proof" and "Ex nA", "Intrinsic safety" and "Explosion-proof".		
9) M12 delivered without cable socket		
F) Subject to export regulations AL: 9I999, ECCN: N.		

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Selection and Ordering data			Order No.	
For absolute pressure (from the gauge pressure series)				
SITRANS P DS III PA (PROFIBUS PA)		F)	7 MF 4 2 3 4 -	
SITRANS P DS III FF (FOUNDATION Fieldbus)		F)	7 MF 4 2 3 5 -	
			■ ■ ■ ■ ■ - ■ ■ ■ ■ ■	
Measuring cell filling	Measuring cell cleaning			
Silicone oil	normal	1		
Inert liquid ¹⁾	Grease-free	3		
Nominal measuring range				
250 mbar a	(3.63 psi a)	D		
1300 mbar a	(18.9 psi a)	F		
5 bar a	(72.5 psi a)	G		
30 bar a	(435 psi a)	H		
Wetted parts materials				
Seal diaphragm	Process connection			
Stainless steel	Stainless steel	F)	A	
Hastelloy	Stainless steel	F)	B	
Hastelloy	Hastelloy	F)	C	
Version as diaphragm seal ^{2) 3) 4)}			Y	
Process connection				
• Connection shank G½B to EN 837-1		0		
• Female thread ½-14 NPT		1		
• Stainless steel oval flange				
- Mounting thread 7/16-20 UNF to EN 61518		2		
- Mounting thread M10 to DIN 19213		3		
- Mounting thread M12 to DIN 19213		4		
• Male thread M20 x 1.5		5		
• Male thread ½ -14 NPT		6		
Non-wetted parts materials				
• Housing made of die-cast aluminium		0		
• Housing stainless steel precision casting		3		
Version				
• Standard versions		1		
• International version, English label inscriptions, documentation in 5 languages on CD		2		
Hazardous area rating				
• General purpose			A	
• ATEX Hazardous approval				
- "Intrinsically safe (EEx ia)"			B	
- "Explosion-proof (EExd)" ⁵⁾			D	
- "Intrinsically safe and explosion-proof (EEx ia + EEx d)" ⁶⁾			P	
- use in zone 2			E	
- "Intrinsically safe, explosion-proof enclosure and dust explosion protection (EEx ia + EEx d + zone 1D/2D)" ⁶⁾			R	
• FM/CSA Hazardous approval				
- "Intrinsically Safe und explosion proof (is + xp)" ⁵⁾			NC	
Electrical connection / cable entry				
• Screwed gland M20 x 1.5			B	
• ½-14 NPT			C	
• M12 connectors (metal) ⁷⁾			F	

Selection and Ordering data		Order No.
For absolute pressure (from the gauge pressure series)		
SITRANS P DS III PA (PROFIBUS PA)	F)	7 MF 4 2 3 4 -
SITRANS P DS III FF (FOUNDATION Fieldbus)	F)	7 MF 4 2 3 5 -
		
Indicator		
• Without indicator		0
• Without indicator (digital display hidden, setting: mA)		1
• With indicator (digital display visible, setting: mA)		6
• With indicator (digital display visible, settings as specified, Order Code "Y21" required)		7
Included in delivery of the device:		
• Brief instructions (Leporello)		
• CD-ROM with detailed documentation		
1) For oxygen cleaning application, add Order code E10.		
2) Version 7MF4233-1DY... only up to max. span 200 mbar a (2.9 psi a).		
3) When the manufacture's certificate (calibration certificate) has to be ordered for transmitters with diaphragm seals according to IEC 60770-2, it is recommended only to order this certificate exclusively with the diaphragm seals. The measuring accuracy of the <u>total</u> combination is certified here.		
4) If the acceptance test certificate 3.1 is ordered for the transmitter with mounted diaphragm seals this certificate must also be ordered with the respective remote seals.		
5) Without cable gland, with blanking plug		
6) With enclosed cable gland EEx ia and blanking plug		
7) M12 delivered without cable socket		
F) Subject to export regulations AL: 91999, ECCN: N.		

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Selection and Ordering data	Order code			
Further designs		HART	PA	FF
Add "-Z" to Order No. and specify Order Code.				
Pressure transmitter with mounting bracket (2 shackles, 4 nuts, 4 U-plates, 1 angle) made of:				
• Steel	A01	✓	✓	✓
• Stainless steel	A02	✓	✓	✓
plug				
• Han 7D (metal, gray)	A30	✓		
• Han 8U (instead of Han 7D)	A31	✓		
• Angled	A32	✓		
Cable sockets for M12 connectors (metal)	A50	✓	✓	✓
Rating plate inscription (instead of German)				
• English	B11	✓	✓	✓
• French	B12	✓	✓	✓
• Spanish	B13	✓	✓	✓
• Italian	B14	✓	✓	✓
English rating plate	B21	✓	✓	✓
Pressure units in inH ₂ O and/or psi				
Factory calibration certificate¹⁾	C11	✓	✓	✓
Material traceability certificate²⁾	C12	✓	✓	✓
Factory certificate of conformance	C14	✓	✓	✓
SIL2 certificate per IEC 61508 / 61511	C20	✓		
PROFIsafe certificate and protocol	C21		✓	
Setting of upper limit of output signal to 22.0 mA	D05	✓		
Manufacturer's declaration acc. to NACE	D07	✓	✓	✓
Degree of protection IP68 (only for M20 x 1.5 and ½-14 NPT)	D12	✓	✓	✓
Supplied with oval flange (1 item), PTFE packing and screws in thread of oval flange	D37	✓	✓	✓
Brad Harrison Connector	D40	✓	✓	✓
Use in or on zone 1D/2D (only together with type of protection "Intrinsic safety (EEx ia)")	E01	✓	✓	✓
Oxygen application (In the case of oxygen measurement and inert liquid max. 120 bar a (1740 psi a) at 60°C (140 °F))	E10	✓	✓	✓

Selection and Ordering data	Order code			
Further designs		HART	PA	FF
Add "-Z" to Order No. and specify Order Code.				
Two coats of lacquer on casing and cover (PU on epoxy)	G10	✓	✓	✓
Additional data				
Please add "-Z" to Order No. and specify Order code(s) and plain text.				
Calibrated range Specify in plain text (max. 5 characters): Y01: X to Y psi, inH ₂ O, ftH ₂ O...	Y01	✓		
Tag number/identification (max. 16 characters), specify in plain text: Y15:	Y15	✓	✓	✓
Tag description (max. 27 characters), specify in plain text: Y16:	Y16	✓	✓	✓
Entry of HART (TAG) (max. 8 characters), specify in plain text: Y17:	Y17	✓		
Pressure units for digital display specify in plain text: Y21: psi, inH ₂ O, ftH ₂ O ...	Y21	✓	✓	✓
Pressure units for digital display				
Non-Pressure units for digital display³⁾ (measuring range in pressure units ("Y01"/"Y02") mandatory) specify in plain text: Y22: X to Y GPM, MGD, Feet ...	Y22 + Y01	✓		
Preset bus address possible between 1 and 126 Specify in plain text: Y25:	Y25		✓	
Factory mounting of valve manifolds, see accessories.				
Only "Y01", "Y21", "Y22", "Y25" and "D05" can be factory preset				

✓ = available

¹⁾ When the manufacture's certificate (calibration certificate) has to be ordered for transmitters with diaphragm seals according to IEC 60770-2, it is recommended only to order this certificate exclusively with the diaphragm seals. The measuring accuracy of the total combination is certified here.

²⁾ If the acceptance test certificate 3.1 is ordered for the transmitter with mounted diaphragm seals this certificate must also be ordered with the respective remote seals.

³⁾ Preset values can only be changed over SIMATIC PDM.

