BD SENSORS
pressure measurement

DS 400 P

Intelligent Electronic Pressure Switch in Hygienic Stainless Steel Ball Housing

- hygienic process connections with flush welded stainless steel diaphragm
- up to 2 independent contacts, configurable
- optionally:
  - analogue output
  - Ex-protection (for 2-wire)
- nominal pressure range from 0 ... 100 mbar up to 0 ... 40 bar

Description

The electronic pressure switch DS 400 P is the successful combination of

- intelligent pressure switch
- digital display

and has been developed for process industry; especially for food industry and pharmacy. Besides the DS 400 P is suitable for applications with high requirements on hygienic process connections and a rugged housing which is easy to clean.

As standard the DS 400 P offers a PNP contact and is optionally available with a second, independent contact. Additionally the device could be equipped with an analogue output. The 2-wire version is also available with Ex-protection.

Operating

The display module, which is mounted rotatable in the ball housing, shows the system pressure and allows programming. The configuration is menu controlled and easy to handle without previous knowledge.

Applications

- process industry
- food industry
- pharmacy

Characteristics

- indication of measured values on a 4-digit LED display
- rotatable and configurable display module
- configurable contacts (switch on / switch off points, hysteresis / window mode, switch on / switch off delay)
- option analogue output:
  - 3-wire version: 4 ... 20 mA or 0 ... 10 V **with turn-down 1:6**
  - 2-wire version: 4 ... 20 mA **Ex-protection optionally**
- special functions (access protection, min. / max. value memory)
- industrial standard in view of accuracy, thermal behaviour and long term stability

CE Ex

DS 400 P
Electronic Pressure Switch

TÜV CERT DIN EN ISO 9001

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Input pressure range											
Nominal pressure gauge [bar]	-1 ... 0	0.1	0.25	0.4	1	2.5	4	10	25	40
Nominal pressure abs. [bar]	-	-	-	-	1	2.5	4	10	25	40
Permissible overpressure [bar]	3	1	1	1	3	6	20	60	60	100

Contact [1]			
Number, type	standard: 1 PNP contact		option: 2 independent PNP contacts
Max. switching current	2-wire: contact rating 125 mA, short-circuit resistant; $V_{switch} = V_S - 2V$ 3-wire: contact rating 500 mA, short-circuit resistant		
Accuracy of contacts		IEC 60770	BFSL
	standard: nominal pressure > 0.4 bar:	≤ ± 0.35 % FSO	≤ ± 0.175 % FSO
	nominal pressure ≤ 0.4 bar:	≤ ± 0.50 % FSO	≤ ± 0.250 % FSO
	option: nominal pressure > 0.4 bar:	≤ ± 0.25 % FSO	≤ ± 0.125 % FSO
Repeatability	≤ ± 0,1 % FSO		
Switching frequency	2-wire: max. 10 Hz / 3-wire: 50 Hz		
Switching cycles	> 100 x 10^6		
Delay time	0 ... 100 sec.		

[1] with Ex-protection max. 1 contact possible

Analogue output (optionally) / Supply			
2-wire current signal	4 ... 20 mA / V_S = 18 ... 41 V_{DC} permissible load: $R_{max} = [(V_S - V_{S\,min}) / 0.02]\ \Omega$		response time: < 10 ms
2-wire current signal with Ex-protection	4 ... 20 mA / V_S = 17 ... 28 V_{DC} permissible load: $R_{max} = [(V_S - V_{S\,min}) / 0.02]\ \Omega$		response time: < 10 ms
3-wire current signal	4 ... 20 mA / V_S = 24 V_{DC} ± 10 % adjustable (turn-down of span 1:6) [2] permissible load: R_{max} = 500 Ω		response time: < 30 ms
3-wire voltage signal	0 ... 10 V / V_S = 24 V_{DC} ± 10 % adjustable (turn-down of span 1:6) [2] permissible load: R_{min} = 10 kΩ		response time: < 30 ms
Without analogue output	V_S = 15 ... 36 V_{DC}		
Accuracy		IEC 60770 [3]	BFSL
	standard: nominal pressure > 0.4 bar:	≤ ± 0.35 % FSO	≤ ± 0.175 % FSO
	nominal pressure ≤ 0.4 bar:	≤ ± 0.50 % FSO	≤ ± 0.250 % FSO
	option: nominal pressure > 0.4 bar:	≤ ± 0.25 % FSO	≤ ± 0.125 % FSO

[2] with turn-down of span the analogue signal is adjusted automatically to the new measuring range
[3] accuracy according to IEC 60770 – limit point adjustment (non-linearity, hysteresis, repeatability)

Thermal errors (offset and span) [4]/ Permissible temperatures						
Nominal pressure P_N [bar]	-1 ... 0	≤ 0.1	≤ 0.25	≤ 0.4	≤ 1	> 1
Tolerance band [% FSO]	≤ ± 0.75	≤ ± 2	≤ ± 1.5	≤ ± 1	≤ ± 1	≤ ± 0.75
TC, average [% FSO / 10 K]	± 0.12	± 0.4	± 0.3	± 0.2	± 0.15	± 0.12
in compensated range [°C]	0 ... 70	0 ... 50			0 ... 70	
Permissible temperatures	medium: -25 ... 125 °C [5]	electronics / environment: -25 ... 85 °C			storage: -40 ... 85 °C	

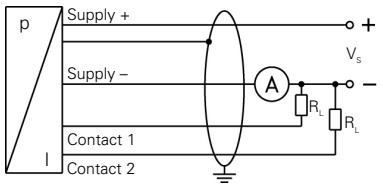
[4] an optional cooling element can influence thermal effects for offset and span depending on installation position and filling conditions
[5] for vacuum ranges and nominal pressure abs. the max. medium temperature is 70 °C;
with optional cooling element its maximum permissible temperature is valid

Electrical protection	
Short-circuit protection	permanent
Reverse polarity protection	no damage, but also no function
Electromagnetic compatibility	emission and immunity according to EN 61326
Mechanical stability	
Vibration	5 g RMS (20 ... 2000 Hz)
Shock	100 g / 11 msec.
Filling fluids	
Standard	Silicon oil
Optional	food compatible oil (with FDA approval) / Halocarbon / others on request
Materials	
Pressure port	stainless steel 1.4435 (316L)
Housing	stainless steel 1.4301 (304)
Viewing glass	laminated safety glass
Seals (media wetted)	inch thread: standard: FKM (recommended for medium temperatures ≤ 200 °C) optionally: FFKM (recommended for medium temperatures > 200 °C); others on request clamp and dairy pipe: without
Diaphragm	stainless steel 1.4435 (316L)
Media wetted parts	pressure port, seals, diaphragm

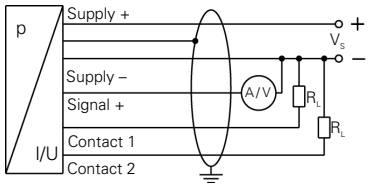
Explosion protection (optionally for 4 ... 20 mA / 2-wire)	
Approval AX14-DS 400P	zone 0: II 1 G EEx ia IIC T4
Safety technical maximum values	U_i = 28 V, I_i = 93 mA, P_i = 660 mW
Max. switching current [6]	70 mA
Permissible temperatures for environment	in zone 0: -20 ... 60 °C with p_{atm} 0.8 bar up to 1.1 bar in zone 1: -25 ... 70 °C
Connecting cables (by factory)	cable capacitance: signal line/shield also signal line/signal line: 160 pF/m cable inductance: signal line/shield also signal line/signal line: 1 µH/m
[6] the real switching current in the application depends on the power supply unit	
Miscellaneous	
Display	4-digit, 7-segment-LED display, visible range 37.2 x 11 mm; digit height 10 mm, range of indication -1999 ... +9999; accuracy 0.1% ± 1 digit; digital damping 0.3 ... 30 sec (programmable); measured value update 0.0 ... 10 sec (programmable)
Current consumption (without contacts)	2-wire signal output current: max. 25 mA 3-wire signal output current: approx. 30 mA + signal current 3-wire signal output voltage: approx. 30 mA
Ingress protection	IP 67
Installation position	any [7]
Weight	min. 500 g (depending on mechanical connection)
Operational life	> 100 x 10^6 cycles
[7] Pressure switches are calibrated in a vertical position with the pressure connection down. If this position is changed on installation there can be slight deviation in the zero point for pressure ranges ≤ 1 bar. Therefore installation position has to be given in this case.	

Wiring diagrams

2-wire-system (current) [8]



3-wire-system (current / voltage)

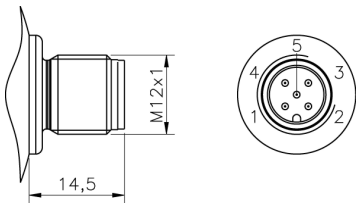


[8] for devices with Ex-protection the operating manual has to be considered

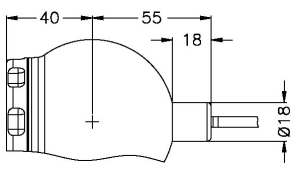
Pin configuration

Electrical connection	M12x1 metal (5-pin)	cable colours (DIN 47100)
Supply +	1	white
Supply –	3	brown
Signal + (only 3-wire)	2	green
Contact 1	4	grey
Contact 2	5	pink
Ground	plug housing / pressure port	yellow / green (shield)

Electrical connection



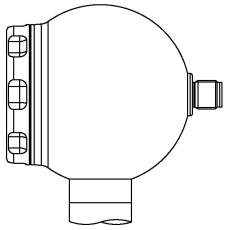
M12x1 (5-pin)



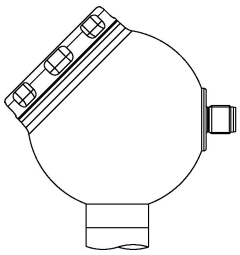
cable outlet [9]

[9] different cable types and lengths available; standard: 2 m PVC cable (without ventilation tube)

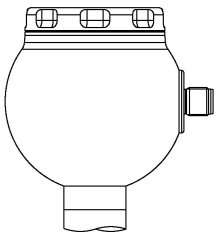
Designs [10]



side display



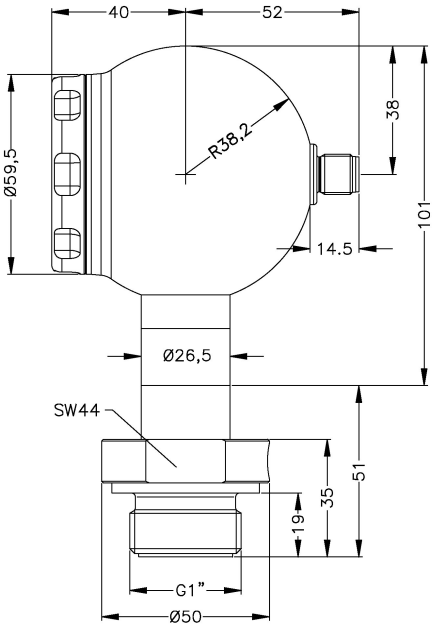
45° display (on request)

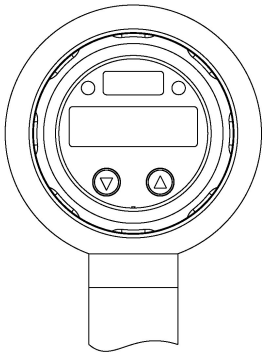


top display (on request)

[10] *all designs in horizontal rotatable housing as standard*

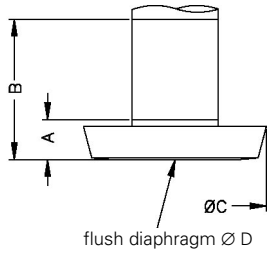
Mechanical connections





G1“ flush (DIN 3852)

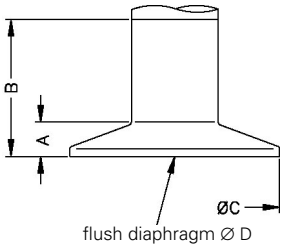
Dairy pipe (DIN 11851)



flush diaphragm Ø D

Dimensions in mm			
Size	DN 25	DN 40	DN 50
A	14	23	23.5
B	44	23	23.5
C	44	56	68.5
D	24	32	45

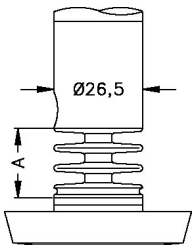
Clamp (ISO 2852)



flush diaphragm Ø D

Dimensions in mm			
Size	1“	1 1/2“	2“
A	11	11	22
B	41	41	22
C	50.5	50.5	64
D	24	32	45

Cooling element



Dimensions in mm		
Size	150° C	300° C
A	22	34

⇨ Total length of devices with Ex-protection increases by 20 mm!

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Ordering code DS 400P

DS 400P ☐☐☐-☐☐☐☐-☐☐-☐-☐-☐-☐☐☐-☐☐☐-☐-☐-☐-☐☐☐

Pressure		
gauge		7 A 5
absolute [1, 2]		7 A 6
Input	[bar]	
0,10		1 0 0 0
0,25		2 5 0 0
0,40		4 0 0 0
1,0		1 0 0 1
2,5		2 5 0 1
4,0		4 0 0 1
10		1 0 0 2
25		2 5 0 2
40		4 0 0 2
-1 … 0 [2]		X 1 0 2
customer		9 9 9 9
Design		
Stainless steel globe housing (side display)		K H
Stainless steel globe housing (45° display)		K 4
Stainless steel globe housing (top display)		K V
Analogue output		
without		0
4 … 20 mA / 2-wire		1
0 … 10 V / 3-wire, adjustable		3
4 … 20 mA / 3-wire, adjustable		7
Intrinsic safety 4 … 20 mA / 2-wire [1]		E
customer		9
Contact		
1 contact		1
2 contacts [3]		2
Accuracy		
standard for $P_N > 0,4$ bar	0,35 %	3
standard for $P_N \leq 0,4$ bar	0,5 %	5
option for $P_N > 0,4$ bar	0,25 %	2
customer		9
Electrical connection		
M12x1 (5-pin) / metal version		N 1 0
Cable outlet [4]		T A 0
customer		9 9 9
Mechanical connection		
G1" with flush welded diaphragm (DIN 3852)		Z 3 1
Clamp 1" (ISO 2852)		C 6 1
Clamp 1 1/2" (ISO 2852)		C 6 2
Clamp 2" (ISO 2852)		C 6 3
Dairy pipe DN 25 (DIN 11851) [5]		M 7 3
Dairy pipe DN 40 (DIN 11851) [5]		M 7 5
Dairy pipe DN 50 (DIN 11851) [5]		M 7 6
customer		9 9 9
Diaphragm		
Stainless steel 1.4435 (316L)		1
customer		9
Seals		
for clamp or dairy pipe:	none	0
for inch thread:	FKM	1
	FFKM	7
customer		9
Filling Fluids		
Silicon oil		1
food compatible oil [6]		2
Halocarbon		C
customer		9
Special version		
standard		0 0 0
with cooling element up to 150°C		1 5 0
with cooling element up to 300°C		2 0 0
customer		9 9 9

[1] absolute pressure possible from 1 bar
[2] for vacuum and nominal pressure abs. the max. medium temperature is 70 °C
[3] with Ex version max. 1 contact is possible
[4] standard: 2 m PVC cable without ventilation tube, optionally cable with ventilation tube
[5] The cup nut for dairy pipe has to be mounted by production of pressure transmitter. The cup nut for dairy pipe has to be ordered as separate position.
[6] Name of oil: Mobil DTE FM 32; Category Code: H1; NSF Registration No.: 130662

This ordering code contains product specification; properties are not guaranteed. Subject to change without notice.

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