DS 400

Intelligent Electronic Pressure Switch Completely in Stainless Steel

▸ piezoresistive stainless steel sensor

▸ up to 2 independent contacts, configurable

▸ optional:
 - analogue output
 - Ex-protection (for 2-wire)

▸ nominal pressure range from 0 ... 100 mbar up to 0 ... 600 bar

Description

The electronic pressure switch DS 400 is the successful combination of

▸ intelligent pressure switch

▸ digital display

and is suitable for universal usage. As standard the DS 400 offers a PNP contact and is optionally available with a second, independent contact. Additionally the device could be equipped with an analogue output, which has a turn-down-possibility of 1:6 for the 3-wire-version. The 2-wire version is also available with Ex-protection. **So BD SENSORS is one of the few competitors on the world market offering intelligent, intrinsically safe electronic pressure switches for the use in explosion hazard areas.**

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

▸ machine and plant engineering

▸ test benches

▸ environmental engineering

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

C E ⟨Ex⟩

DS 400
Electronic Pressure Switch

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]	-	0.1	0.25	0.4	1	2.5	4	10	25	40
Permissible overpressure	[bar]	3	1	1	1	3	6	20	60	60	100
Nominal pressure gauge [1]	[bar]	100			250			400			600
Nominal pressure abs.	[bar]	100			250			400			600
Permissible overpressure	[bar]	340			600			600			1000

[1] measurement starts with ambient pressure

Contact [2]

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.

[2] 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) [4] 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) [4] 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

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

Thermal errors (offset and span) / 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]	± 0.07	± 0.3	± 0.2	± 0.14	± 0.1	± 0.07
in compensated range	[°C]	0 ... 70		0 ... 50		0 ... 70	
Permissible temperatures		medium: -25 ... 125 °C electronics / environment: -25 ... 85 °C storage: -40 ... 85 °C					

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.

Materials

Pressure port	stainless steel 1.4571 (316Ti)
Housing	stainless steel 1.4301 (304)
Viewing glass	laminated safety glass
Seals (media wetted)	standard: P_N ≤ 40 bar: FKM / P_N > 40 bar: NBR
Diaphragm	stainless steel 1.4435 (316L)
Media wetted parts	pressure port, seals, diaphragm

Explosion protection (for 2-wire current signal with Ex-protection)

Approval AX14-DS 400	zone 0: II 1 G EEx ia IIC T4
Safety techn. maximum values	U_i = 28 V, I_i = 93 mA, P_i = 660 mW
Max. switching current [5]	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

[5] the real switching current in the application depends on the power supply unit

DS 400

Electronic Pressure Switch

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 [6]
Weight	approx. 400 g
Operational life	> 100 x 10^6 cycles

[6] 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.

Wiring diagrams

2-wire-system (current) [7]

3-wire-system (current / voltage)

[7] 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 [8]

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

Designs [9]

side display

45° display (on request)

top display (on request)

[9] all designs in horizontal rotatable housing as standard

DS 400

Electronic Pressure Switch

Dimensions

Ø59,5
40
52
R38,2
38
101
14.5
Ø26,5
SW27
38
14
G1/2"

G1/2" DIN 3852
M20x1.5

SW27
23
47

G1/2" EN 837
M20x1.5

SW27
12
38
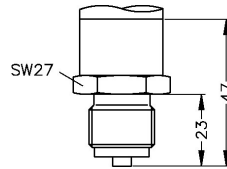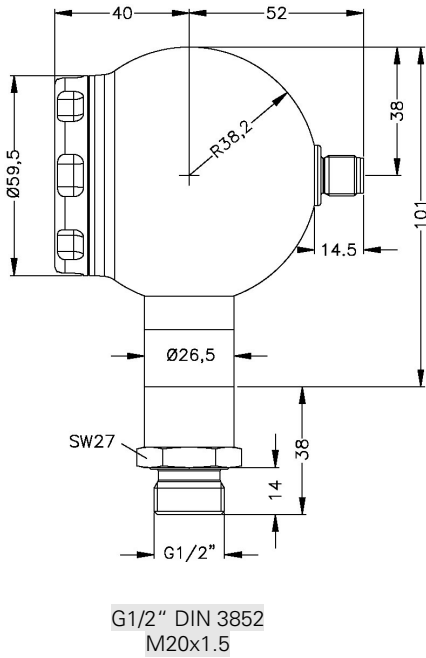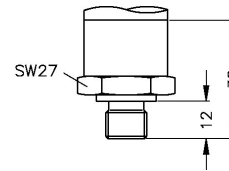
G1/4" DIN 3852
M10x1; M12x1; M12x1.5
(up to 100 bar)

SW27
15
39

G1/4" EN 837

SW27
20
44

1/2" NPT

SW27
14
38
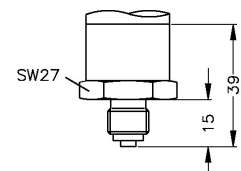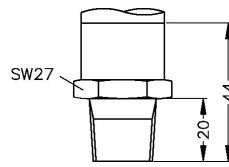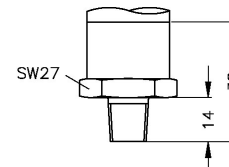
1/4" NPT

Optional for P$_N$ from 0.1 up to 40 bar

26,5
14
A
G1/2"
O-RingFKM
0.9
Ø13.2
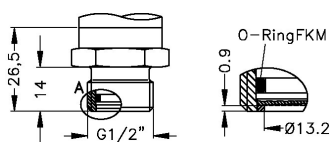
G1/2" flush DIN 3852
M20x1.5

125
Ø40
16
G3/4"
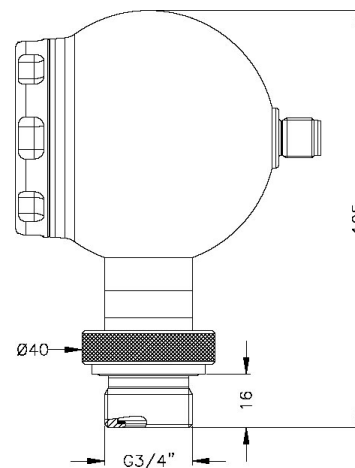
G3/4" flush DIN 3852
(on request)

⇨ Total length of devices with nominal pressure range P$_N$ > 40 increases by 14 mm!
⇨ Total length of devices with Ex-protection increases by 10 mm (with welded version by 20 mm)!

DS400_E_010707

BD | SENSORS
pressure measurement

Ordering code DS 400

DS 400 □□□ - □□□□ - □□ - □ - □ - □ - □□□ - □□□ - □ - □□□

Pressure																					
gauge	7	A	0																		
absolute	7	A	1																		

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														
100 [1]				1	0	0	3														
250 [1]				2	5	0	3														
400 [1]				4	0	0	3														
600 [1]				6	0	0	3														
-1 ... 0				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 [2]											2										

Accuracy																					
standard for $P_N > 0,4$ bar	0,35 %											3									
standard for $P_N ≤ 0,4$ 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 [3]													T	A	0						
customer													9	9	9						

Mechanical connection																					
G1/2" DIN 3852																1	0	0			
G1/2" EN 837																2	0	0			
G1/4" DIN 3852																3	0	0			
G1/4" EN 837																4	0	0			
G1/2" DIN 3852 with [4] flush sensor																F	0	0			
G3/4" DIN 3852 with [4] flush sensor																K	0	0			
1/2" NPT																N	0	0			
1/4" NPT																N	4	0			
customer																9	9	9			

Seals																					
for $P_N ≤ 40$ bar:	FKM																		1		
	without (welded version) [5]																		2		
for $P_N > 40$ bar:	NBR																		5		
	customer																		9		

Special version																					
standard																				0 0 0	
customer																				9 9 9	

[1] measurement starts with ambient pressure

[2] with Ex version max. 1 contact is possible

[3] standard: 2 m PVC cable without ventilation tube, optionally cable with ventilation tube

[4] not possible for nominal pressure $P_N > 40$ bar; also not possible for vacuum ranges

[5] welded version only with pressure ports according to EN 837; not available with pressure ranges 0.1 bar and > 40 bar

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