



# DS 401

## Intelligent Electronic Pressure Switch Stainless Steel

Ceramic Sensor

accuracy according to IEC 60770:  
0.5 % FSO

### Nominal pressure

from 0 ... 400 mbar up to 600 bar

### Contacts

1 or 2 independent PNP contacts,  
freely configurable

### Analogue output

2-wire: 4 ... 20 mA

3-wire: 4 ... 20 mA / 0 ... 10 V

others on request

### Special characteristics

- ▶ indication of measured values on a 4-digit LED display
- ▶ rotatable and configurable display module

### Optional versions

- ▶ **IS-version**  
Ex ia = intrinsically safe for gases and dust
- ▶ pressure port PVDF
- ▶ customer specific versions

The electronic pressure switch DS 401 is the successful combination of

- ▶ intelligent pressure switch
- ▶ digital display

and has been specially designed for universal usage in industry applications; with flush diaphragm the DS 401 is suitable for the usage in viscous, pasty or highly contaminated media. The rotatable stainless steel housing is predestined for rough conditions and difficult installing conditions, caused by the high functionality and robustness. As standard the DS 401 offers a PNP contact and is optionally available with a second, independent contact. Additionally the DS 401 could be equipped with an analogue output

### Preferred areas of use are



Plant and Machine Engineering



Environmental Engineering  
(water – sewage – recycling)



Water



Hydraulic Oil



Input pressure ranges																		
Nominal pressure gauge [bar]	-1...0	0.4	0.6	1	1.6	2.5	4	6	10	16	25	40	60	100	160	250	400	600
Nominal pressure abs. [bar]	-	-	0.6	1	1.6	2.5	4	6	10	16	25	40	60	100	160	250	400	600
Level gauge [mH <sub>2</sub> O]	-	4	6	10	16	25	40	60	100	160	250	400	600	-	-	-	-	-
Overpressure [bar]	4	1	2	2	4	4	10	10	20	40	40	100	100	200	400	400	600	800
Burst pressure ≥ [bar]	7	2	4	4	5	5	12	12	25	50	50	120	120	250	500	500	650	880
Vacuum resistance	P <sub>N</sub> ≥ 1 bar: unlimited vacuum resistance P <sub>N</sub> < 1 bar: on request																	

### Contact<sup>1</sup>

Number, type	standard: 1 PNP contact	option: 2 independent PNP contacts
Max. switching current	4 ... 20 mA / 2- and 3-wire: 0 ... 10 V / 3-wire:	contact rating 125 mA, short-circuit resistant; V <sub>Switch</sub> = V <sub>S</sub> - 2V contact rating 125 mA, short-circuit resistant
Accuracy of contacts <sup>2</sup>	≤ ± 0.5 % FSO	
Repeatability	≤ ± 0.2 % FSO	
Switching frequency	2-wire: max. 10 Hz	/ 3-wire: 50 Hz
Switching cycles	> 100 x 10 <sup>6</sup>	
Delay time	0 ... 100 sec	

<sup>1</sup> with Ex-protection max. 1 contact possible

<sup>2</sup> accuracy according to IEC 60770 – limit point adjustment (non-linearity, hysteresis, repeatability)

### Analogue output (optionally) / Supply

2-wire current signal	4 ... 20 mA / V <sub>S</sub> = 13 ... 36 V <sub>DC</sub> permissible load: R <sub>max</sub> = [(V <sub>S</sub> - V <sub>Smin</sub> ) / 0.02 A] Ω	response time: < 10 msec
2-wire current signal, Ex-protection	4 ... 20 mA / V <sub>S</sub> = 15 ... 28 V <sub>DC</sub> permissible load: R <sub>max</sub> = [(V <sub>S</sub> - V <sub>Smin</sub> ) / 0.02 A] Ω	response time: < 10 msec
3-wire current signal	4 ... 20 mA / V <sub>S</sub> = 24 V <sub>DC</sub> ± 10 % adjustable (turn-down of span 1:5) <sup>3</sup> permissible load: R <sub>max</sub> = 500 Ω	response time: < 30 msec
3-wire voltage signal	0 ... 10 V / V <sub>S</sub> = 24 V <sub>DC</sub> ± 10 % adjustable (turn-down of span 1:5) <sup>3</sup> permissible load: R <sub>min</sub> = 10 kΩ	response time: < 30 msec
Without analogue output	V <sub>S</sub> = 15 ... 36 V <sub>DC</sub>	
Accuracy <sup>2</sup>	≤ ± 0.5 % FSO	

<sup>3</sup> with turn-down of span the analogue signal is adjusted automatically to the new measuring range

### Thermal effects (Offset and Span) / Permissible temperatures

Thermal error	≤ ± 0.2 % FSO / 10 K		
in compensated range	-25 ... 85 °C		
Permissible temperatures	medium: -40 ... 125 °C	electronics / environment: -40 ... 85 °C	storage: -40 ... 100 °C

<sup>4</sup> for pressure port of PVDF the minimum permissible temperature is -30 °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	10 g RMS (25 ... 2000 Hz)	according to DIN EN 60068-2-6
Shock	500 g / 1 msec	according to DIN EN 60068-2-27

### Materials

Pressure port / housing	1.4404 (316L) PVDF (for P <sub>N</sub> ≤ 60 bar, G1/2" open port)	
Housing	1.4404 (316L)	
Display housing	stainless steel 1.4301 (304)	
Viewing glass	laminated safety glass	
Seals	standard: FKM option: EPDM (P <sub>N</sub> ≤ 160 bar)	others on request
Diaphragm	ceramics Al <sub>2</sub> O <sub>3</sub> 96 %	
Media wetted parts	pressure port, seals, diaphragm	

### Explosion protection (only for 4 ... 20 mA / 2-wire)

Approval AX14-DS 401	<b>IBExU06ATEX1050 X</b> zone 0: II 1G Ex ia IIC T4 Ga (connector) / II 1G Ex ia IIB T4 Ga (cable) zone 20: II 1D Ex ia IIIC T135 °C Da	
Safety technical maximum values	U <sub>i</sub> = 28 V, I <sub>i</sub> = 93 mA, P <sub>i</sub> = 660 mW, C ≈ 0 nF, L <sub>i</sub> ≈ 0 μH	
Max. switching current <sup>5</sup>	70 mA	
Permissible temperatures for environment	-20 ... 60 °C with p <sub>atm</sub> 0.8 bar up to 1.1 bar	
Connecting cables (by factory)	cable capacitance: signal line/shield also signal line/signal line: 100 pF/m	cable inductance: signal line/shield also signal line/signal line: 1 μH/m

<sup>5</sup> the real switching current in the application depends on the power supply unit

### Miscellaneous

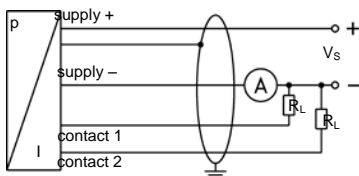
Display	4-digit, 7-segment-LED display, visible range 37.2 x 11 mm; digit height 10 mm, range of indication -1999 ... +9999; accuracy 0.1 % ± 1 digit; digital damping 0.3 ... 30 sec (programmable); measured value update 0.0 ... 10 sec (programmable)	
Option oxygen application <sup>6</sup>	for $P_N \leq 15$ bar: O-ring in 70 EPDM 281 (with BAM-approval); permissible maximum values are 15 bar / 60° C and 10 bar / 90° C for $P_N \leq 25$ bar: O-ring in FKM Vi 567 (with BAM-approval); permissible maximum values are 25 bar / 150° C	
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	
Weight	approx. 400 g	
Operational life	> 100 x 10 <sup>6</sup> pressure cycles	
CE-conformity	EMC Directive: 2004/108/EC	Pressure Equipment Directive: 97/23/EC (module A) <sup>7</sup>
ATEX-Richtlinie	94/9/EG	

<sup>6</sup> not possible with flush pressure ports

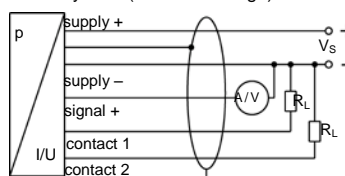
<sup>7</sup> This directive is only valid for devices with maximum permissible overpressure > 200 bar

### Wiring diagrams

2-wire-system (current)



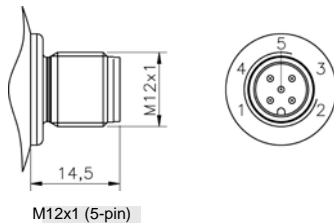
3-wire-system (current / voltage)



### Pin configuration

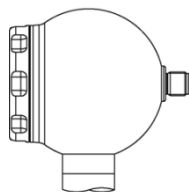
Electrical connections	M12x1 metal (5-pin)
Supply +	1
Supply -	3
Signal + (only 3-wire)	2
Contact 1	4
Contact 2	5
Shield	plug housing / pressure port

### Electrical connections (dimensions in mm)

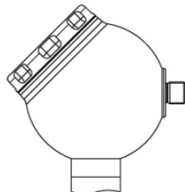


M12x1 (5-pin)

### Design <sup>8</sup>



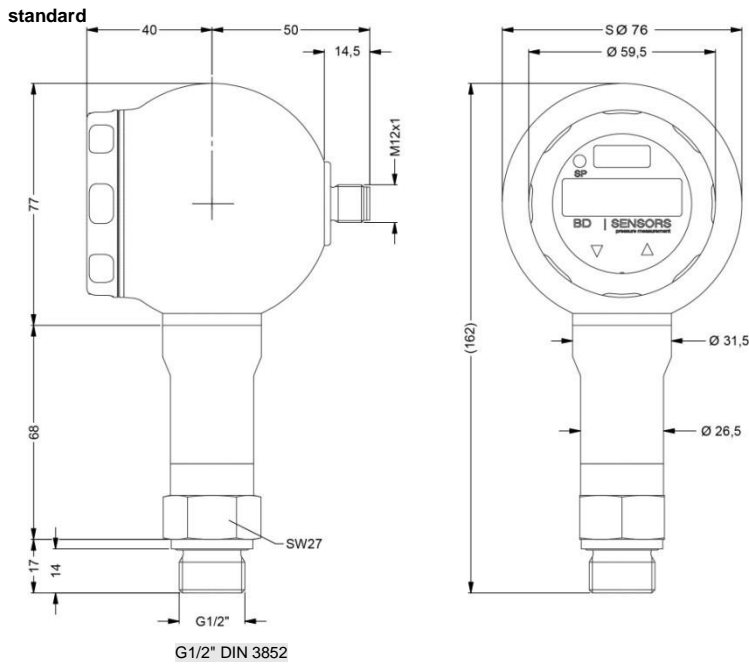
side display



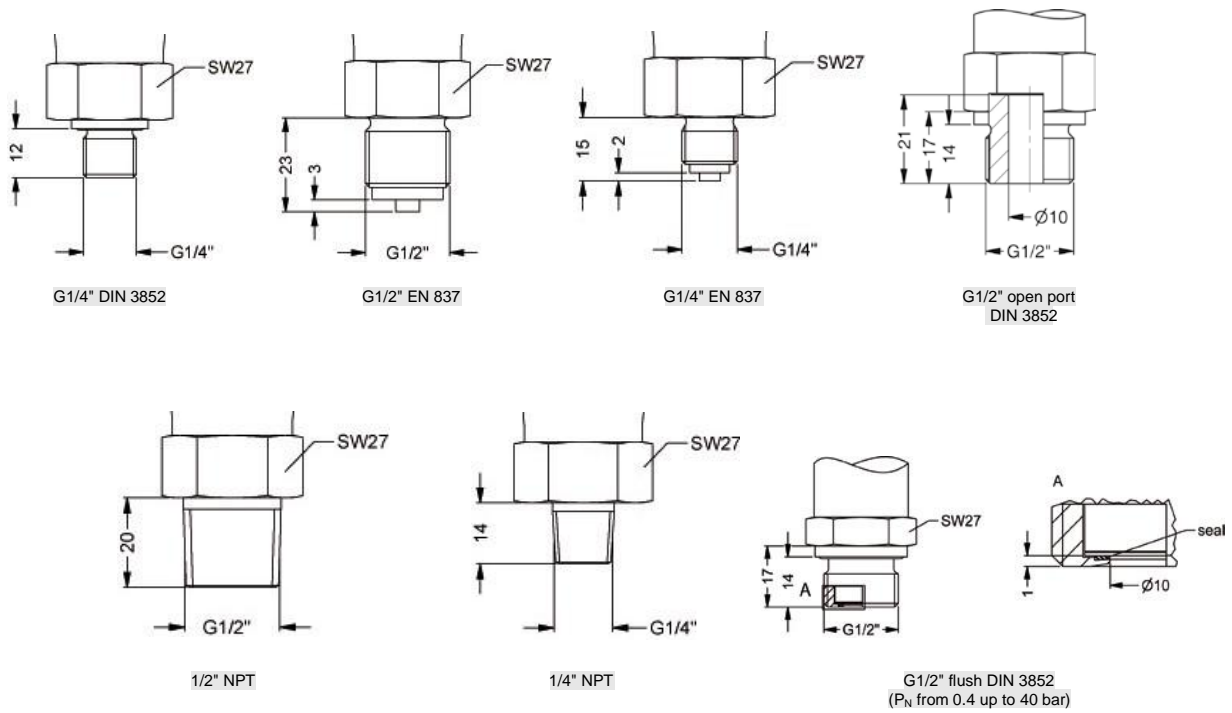
45° display (on request)

<sup>8</sup> all designs in horizontal rotatable housing as standard

**Mechanical connections (dimensions in mm)**



**optionally**



⇒ metric threads and other versions on request

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