BD|SENSORS
pressure measurement

DMP 331Pi

Precision Pressure Transmitter

pressure ports and
process connections with
flush welded stainless steel diaphragm

accuracy according to IEC 60770:
0,1 % FSO

Nominal pressure

from 0 ... 400 mbar up to 0 ... 40 bar

Output signals

2-wire: 4 ... 20 mA
3-wire: 0 … 10 V
others on request

Product characteristics

- excellent temperature response 0.04 % FSO / 10K
- Turn-Down 1:10
- processing of the sensor signal using digital electronics
- process connections suitable for hygienic application
- vacuum resistant

Optional versions

- IS-version
  Ex ia = intrinsically safe for gases and dusts
- communication interface for adjustment of offset, span and damping

The precision pressure transmitter DMP 331Pi demonstrates the further development of well-tried industrial pressure transmitter DMP 331P.

The signal from the specially designed piezoresistive stainless steel sensor is processed by the newly developed digital electronic system, performing thus an active compensation of sensor-specific deviations such as hysteresis, thermal errors and non-linearity.

The temperature range of -40 ... 125 °C can be extended by the integration of a cooling element up to 300 °C.

Preferred areas of use are

- Laboratory techniques
- Food and beverage
- Pharmaceutical industry

74-06

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Pressure ranges [1]							
Nominal pressure gauge / absolute [2] [bar]	0.4	1	2	4	10	20	40
Overpressure [bar]	2	5	10	20	40	80	105
Burst pressure ≥ [bar]	3	7,5	15	25	50	120	210
Vacuum resistance	P_N ≥ 1 bar: unlimited vacuum resistance P_N < 1 bar: on request						

[1] On customer request we adjust the device within the turn-down-possibility by software on the required pressure range.
[2] absolut pressure permissible from 1 bar

Vacuum ranges					
Nominal pressure [bar]	-0.4 ... 0.4	-1 ... 1	-1 ... 2	-1 ... 4	-1 ... 10
Overpressure [bar]	2	5	10	20	40
Burst pressure ≥ [bar]	3	7.5	15	25	50

Output signal / Supply	
Standard	2-wire: 4 ... 20 mA / V_S = 12 ... 36 V_{DC}
Option IS-protection	2-wire: 4 ... 20 mA / V_S = 14 ... 28 V_{DC}
Options	2-wire: 4 ... 20 mA with communication interface [3] 3-wire: 0 ... 10 V / V_S = 14 ... 36 V_{DC} 0 ... 10 V with communication interface [3]

[3] only possible with el. connection Binder series 723 (7-pin)

Performance	
Accuracy [4] performance after turn-down - TD ≤ 1:5 - TD > 1:5	IEC 60770: ≤ ± 0.1 % FSO no change of accuracy [5] for calculation use the following formula (for nominal pressure ranges ≤ 0.40 bar see note 5): ≤ ± [0.1 + 0.015 x turn-down] % FSO with turn-down = nominal pressure range / adjusted range e.g. with a turn-down of 1:10 following accuracy is calculated: ≤ ± (0.1 + 0.015 x 10) % FSO i.e. accuracy is ≤ ± 0.25 % FSO
Permissible load	current 2-wire: R_{max} = [(V_S – V_S min) / 0.02 A] Ω voltage 3-wire: R_{min} = 10 kΩ
Influence effects	supply: 0.05 % FSO / 10 V load: 0.05 % FSO / kΩ
Long term stability	≤ ± (0.1 x turn-down) % FSO / year at reference conditions
Response time	< 5 msec
Adjustability	configuration of following parameters possible (interface / software necessary [6]): - electronic damping: 0 ... 100 sec - offset: 0 ... 90 % FSO - turn down of span: max. 1:10

[4] accuracy according to IEC 60770 – limit point adjustment (non-linearity, hysteresis, repeatability)
[5] except nominal pressure ranges ≤ 0 .40 bar; for these calculation of accuracy is as follows:
≤ ± (0.1 + 0.02 x turn-down) % FSO e.g. turn-down of 1:3: ≤ ± (0.1 + 0.02 x 3) % FSO i.e. accuracy is ≤ ± 0.16 % FSO
[6] software, interface, and cable have to be ordered separately (software appropriate for Windows® 95, 98, 2000, NT Version 4.0 or higher, and XP)

Thermal effects [7] (Offset and Span) / Permissible temperatures		
Tolerance band [% FSO]	≤ ± (0.35 x turn-down)	in compensated range 0 ... 80 °C
TC, average [% FSO / 10 K]	≤ ± (0.035 x turn-down)	in compensated range 0 ... 80 °C
Permissible temperatures [8]	medium:	-40 ... 125 °C for filling fluid silicone oil -10 ... 125 °C for filling fluid food compatible oil
	electronics / environment:	-25 ... 85 °C
	storage:	-40 ... 100 °C
Permissible temperature medium for cooling element 300°C	filling fluid silicone oil	overpressure: -40 … 300 °C vacuum: -40 ... 150 °C [9]
	filling fluid food compatible oil	overpressure: -10 ... 250 °C vacuum: -10 ... 150 °C [9]

[7] an optional cooling element can influence thermal effects for offset and span depending on installation position and filling conditions.
[8] max. temperature of the medium for nominal pressure gauge > 0 bar: 150 °C for 60 minutes with a max. environmental temperature of 50 °C
[9] also for P_{abs} ≤ 1 bar

Electrical protection	
Short-circuit protection	permanent
Reverse polarity protection	no damage, but also no function
Electromagnetic compatibility	emission and immunity according to EN 61326

Filling fluids	
Standard	silicone oil
Options	food compatible oil with FDA approval (Mobil SHC Cibus 32; Category Code: H1; NSF Registration No.: 141500) others on request

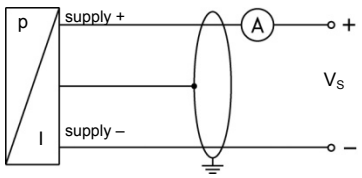
Mechanical stability		
Vibration (DIN EN 60068-2-6)	G 1/2": 20 g RMS (25 ... 2000 Hz);	others except G 1/2": 10 g RMS (25 … 2000 Hz)
Shock (DIN EN 60068-2-27)	G 1/2": 500 g / 1 msec;	others except G 1/2": 100 g / 1 msec

Materials	
Pressure port	stainless steel 1.4435 (316 L) others on request
Housing	stainless steel 1.4404 (316 L)
Option compact field housing	stainless steel 1.4305 (303), cable gland brass, nickel plated others on request
Seals (O-ring)	standard: FKM (recommended for medium temperatures ≤ 200 °C) option: FFKM (recommended for medium temperatures > 200 °C) others on request clamp, dairy pipe, Varivent®: without
Diaphragm	standard: stainless steel 1.4435 (316L) option: Hastelloy® C-276 (2.4819) and Tantalum on request
Media wetted parts	pressure port, diaphragm
Explosion protection (only for 4 ... 20 mA / 2-wire)	
Approvals DX 19-DMP 331Pi	**IBExU 10 ATEX 1068 X / IECEx IBE 12.0027X** zone 0: II 1G Ex ia IIC T4 Ga zone 20: II 1D Ex ia IIIC T 85°C Da
Safety technical maximum values	U_i = 28 V, I_i = 93 mA, P_i = 660 mW, C_i ≈ 0 nF, L_i ≈ 0 µH, the supply connections have an inner capacity of max. 27 nF to the housing
Ambient temperature range	in zone 0: -20 ... 60 °C with p_{atm} 0.8 bar up to 1.1 bar in zone 1 or higher: -20 ... 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
Miscellaneous	
Current consumption	signal output current: max. 25 mA signal output voltage: max. 7 mA
Weight	approx. 200 g
Installation position	any [10]
Operational life	> 100 x 10^6 pressure cycles
CE-conformity	EMC Directive: 2014/30/EU
ATEX Directive	2014/34/EU

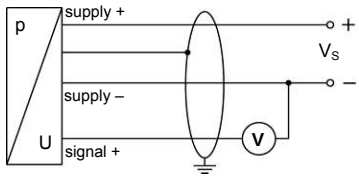
[10] Pressure transmitters are calibrated in a vertical position with the pressure connection down. If this position is changed on installation there can be slight deviations in the zero point for pressure ranges P_N ≤1 bar.

Wiring diagrams

2-wire-system (current)



3-wire-system (voltage)



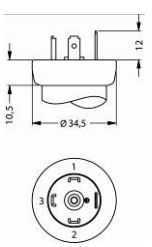
Pin configuration

Electrical connections		ISO 4400	Binder 723 (5-pin)	Binder 723 (7-pin)	M12x1/ metal (4-pin)	field housing	cable colour (IEC 60757)
Supply +		1	3	3	1	IN +	wh (white)
Supply –		2	4	1	2	IN –	bn (brown)
Signal + (only for 3-wire)		3	1	6	3	OUT +	gn (green)
shield		ground pin	5	2	4	⏚	gnye (green-yellow)
Communication interface [11]	RxD	-	-	4	-	-	-
	TxD	-	-	5	-	-	-
	GND	-	-	7	-	-	-

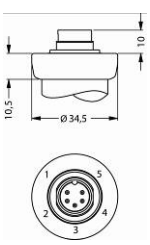
[11] may not be connected directly with the PC (the suitable adapter is available as accessory)

Electrical connections (dimensions in mm)

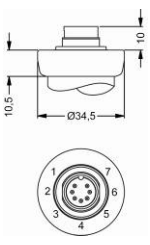
standard option



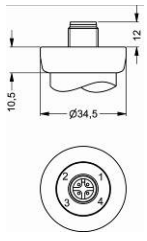
ISO 4400
(IP 65)



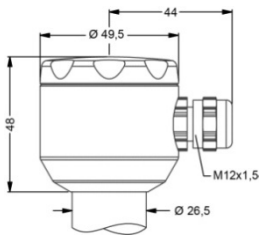
Binder 723
5-pin (IP 67)



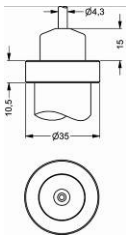
Binder 723
7-pin (IP 67)



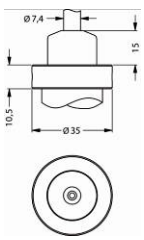
M12x1
4-pin (IP 67)



field housing
(IP 67)



cable outlet [12]
PVC cable (IP 67)

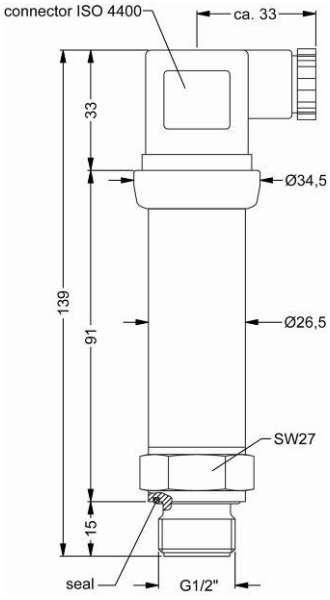


cable outlet [13], with
ventilation tube (IP 68)

[12] standard: 2 m PVC cable (without ventilation tube, permissible temperature: -5 ... 70 °C)
[13] different cable types and lengths available, permissible temperature depends on kind of cable

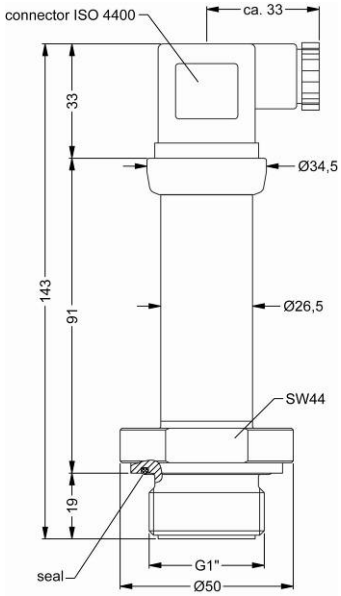
Mechanical connection (dimensions in mm)

standard

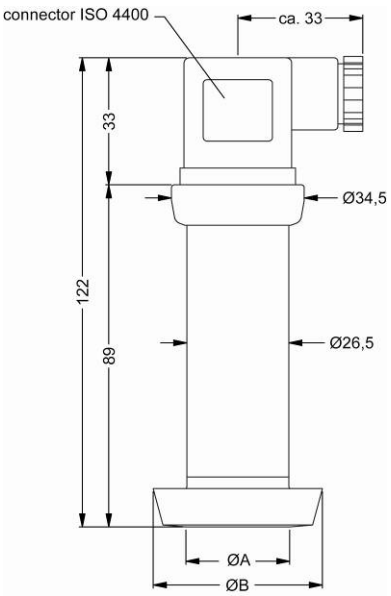


G1/2" flush DIN 3852

option

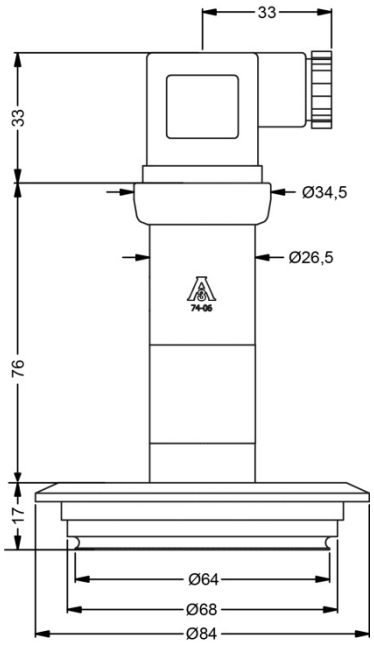


G1" flush DIN 3852

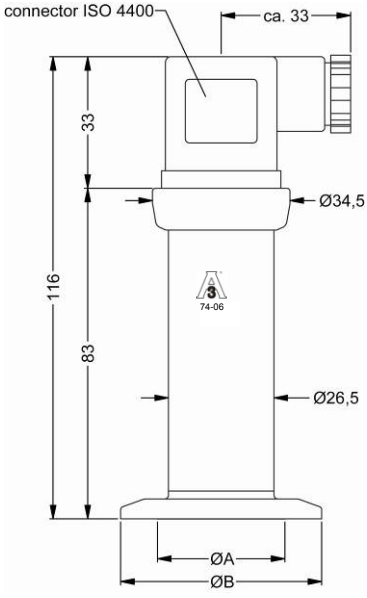


dairy pipe (DIN 11851)

dimensions in mm			
size	DN 25	DN 40	DN 50
A	23	32	45
B	44	56	68.5
P_N [bar]	≤ 40	≤ 40	≤ 25

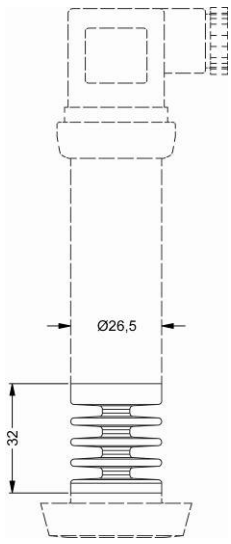


Varivent ®
P_N ≤ 25 bar



Clamp (DIN 32676)

dimensions in mm			
size	DN 25	DN 32	DN 50
A	23	32	45
B	50.5	50.5	64
P_N [bar]	≤ 16	≤ 16	≤ 16



cooling element up to 300 °C

⇨ **metric threads and others on request**

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Ordering code DMP 331Pi

DMP 331Pi □□□-□□□□-□-□-□□□-□□□-□-□-□-□□□

Pressure																									
	gauge	5	0	0																					
	absolute [1]	5	0	1																					
Input	[bar]																								
	0.40 [1]				4	0	0	0																	
	1.0				1	0	0	1																	
	2.0				2	0	0	1																	
	4.0				4	0	0	1																	
	10				1	0	0	2																	
	20				2	0	0	2																	
	40				4	0	0	2																	
	-0.40 … 0.40				S	4	0	0																	
	-1 … 1				S	1	0	2																	
	-1 … 2				V	2	0	2																	
	-1 … 4				V	4	0	2																	
	-1 … 10				V	1	0	3																	
	customer				9	9	9	9																	consult
Output																									
	4 … 20 mA / 2-wire								1																
	Intrinsic safety 4 … 20 mA / 2-wire								E																
	0 … 10 V / 3-wire								3																
	customer								9																consult
Accuracy																									
	0.1%									1															
	customer									9															consult
Electrical connection																									
	Male and female plug ISO 4400										1	0	0												
	Male plug Binder series 723 (5-pin)										2	0	0												
	Male plug Binder series 723 (7-pin) [2]										A	0	0												
	Cable outlet with PVC-cable [3]										T	A	0												
	Cable outlet [4]										T	R	0												
	Male plug M12x1 (4-pin) / metal										M	1	0												
	Compact field housing stainless steel 1.4305 [5]										8	5	0												
	customer										9	9	9												consult
Mechanical connection																									
	G1/2" with flush welded diaphragm (DIN 3852) [6]													Z	0	0									
	G1" with flush welded diaphragm (DIN 3852)													Z	3	1									
	Clamp DN 25 / 1" (DIN 32676) / 3A													C	6	1									
	Clamp DN 32 / 1 1/2" (DIN 32676) / 3A													C	6	2									
	Clamp DN 50 / 2" (DIN 32676) / 3A													C	6	3									
	Clamp 3/4" (DIN 32676) / 3A													C	6	9									
	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									
	Varivent® DN 40/50 / 3A													P	4	1									
	customer													9	9	9									consult
Diaphragm																									
	Stainless steel 1.4435 (316L)																1								
	Hastelloy® C-276 (2.4819)																H								
	Tantalum																T								consult
	customer																9								consult
Seals																									
	for clamp or dairy pipe: without																	0							
	for inch thread - standard: FKM																	1							
	for inch thread - option: FFKM																	7							
	customer																	9							consult
Filling Fluids																									
	silicone oil																		1						
	food compatible oil																		2						
	customer																		9						consult
Special version																									
	standard																			1	1	1			
	RS-232 interface [7]																			1	2	1			
	with cooling element up to 300 °C																			2	1	1			
	RS-232 interface and cooling element up to 300 °C [7]																			2	2	1			
	customer																			9	9	9			consult

absolut pressure possible from 1 bar
cable socket is included in delivery
standard: 2 m PVC cable without ventilation tube (permissible temperature: -5 … 70 °C), others on request
cable with ventilation tube (code TR0 = PVC cable), different cable types and lengths available, price without cable
The cup nut has to be mounted by production of pressure transmitter with electrical connection field housing and mechanical connection dairy pipe.
The cup nut has to be ordered as separate position.
possible only for $P_N \geq 1$ bar
RS-232 interface only possible with el. connection Binder series 723 (7-pin)
Software, Interface and cable for DMP 331 Pi with option RS-232 have to be order separately
(Ordering code: CIS-G; Software appropriate for Windows® 95, 98, 2000, NT Version 4.0 or newer and XP)

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