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

- communication interface for adjustment of offset, span and damping
- IS-version (on request)
- cooling element for media temperatures up to 300 °C

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

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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] absolute 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-version	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 electrical 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: $R_{max} = [(V_S - V_{S\ min}) / 0.02\ A]\ \Omega$ 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)	
Tolerance band [% FSO]	≤ ± (0.35 x turn-down)
TC, average [% FSO / 10 K]	≤ ± (0.035 x turn-down)
in compensated range	0 ... 80 °C

[7] an optional cooling element can influence thermal effects for offset and span depending on installation position and filling conditions

Permissible temperatures		
Filling fluid	silicone oil	food compatible oil
Medium [8]	-40 ... 125 °C	-10 ... 125 °C
Medium with cooling element [9]	overpressure: -40 ... 300 °C vacuum: -40 ... 150 °C [10]	overpressure: -10 ... 250 °C vacuum: -10 ... 150 °C [10]
Electronics / environment	-25 ... 85 °C	
Storage	-40 ... 100 °C	

[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] max. temperature depends on the used sealing material, type of seal and installation
[10] 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 according to 21CFR178.3570 (Mobil SHC Cibus 32; Category Code: H1; NSF Registration No.: 141500) others on request

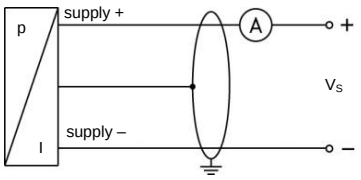
Mechanical stability		
Vibration	according to DIN EN 60068-2-6	G 1/2": 20 g RMS (25 ... 2000 Hz) others: 10 g RMS (25 … 2000 Hz)
Shock	according to DIN EN 60068-2-27	G 1/2": 500 g / 1 msec others: 100 g / 1 msec

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 1.4301 (304); cable gland M12x1.5, brass, nickel plated (clamping range 2 … 8 mm)	
Seals (O-ring)	standard: FKM (recommended for medium temperatures ≤ 200 °C) option: FFKM (recommended for medium temperatures < 260 °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 (on request for 4 ... 20 mA / 2-wire)		
Approvals DX19-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 T135 °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	
Permissible temperatures for environment	in zone 0: -20 ... 60 °C with p_{atm} 0.8 bar up to 1.1 bar in zone 1 or higher: -40/-20 ... 65 °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		
EHEDG certificate Type EL Class I	EHEDG conformity is only ensured in combination with an approved seal. This is e.g. for - Clamp (C61, C62, C63): T-ring-seal from Combifit International B.V. - Varivent® (P41): EPDM-O-ring which is FDA-listed - dairy pipe (M73, M75, M76): ASEPTO-STAR k-flex upgrade seal by Kieselmann GmbH	
Current consumption	signal output current: max. 25 mA signal output voltage: max. 7 mA	
Surface roughness	pressure port R_a < 0.8 µm (media wetted parts) diaphragm R_a < 0.15 µm weld seam R_a < 0.8 µm	
Weight	approx. 200 g	
Installation position	any [11]	
Operational life	100 million load cycles	
CE-conformity	EMC Directive: 2014/30/EU	
ATEX Directive	2014/34/EU	

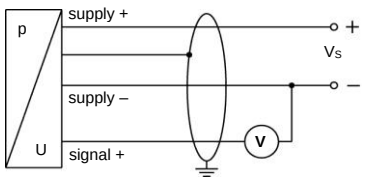
[11] *Pressure transmitters are calibrated in a vertical position with the pressure connection down. If this position is changed on installation there can be slight deviations in the zero point for pressure ranges p_N ≤1 bar.*

Wiring diagrams

2-wire-system (current)



3-wire-system (voltage)

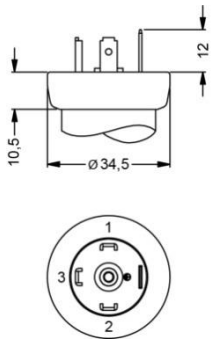


Pin configuration

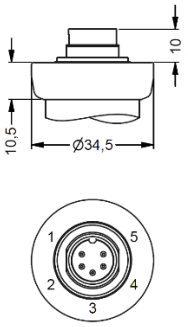
Electrical connections	ISO 4400	Binder 723 (5-pin)	Binder 723/423 (7-pin)	M12x1/ metal (4-pin)	compact field housing	cable colours (IEC 60757)
Supply +	1	3	3	1	IN +	WH (white)
Supply –	2	4	1	2	IN –	BN (brown)
Signal + (only for 3-wire)	3	1	6	3	OUT +	GN (green)
shield	ground pin ⏚	5	2	4	⏚	GNYE (green-yellow)
Communication interface [12] RxD	-	-	4	-	-	-
TxD	-	-	5	-	-	-
GND	-	-	7	-	-	-

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

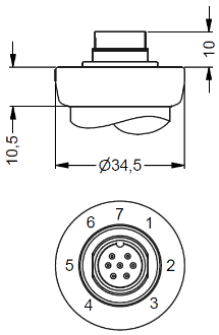
Electrical connections (dimensions in mm)



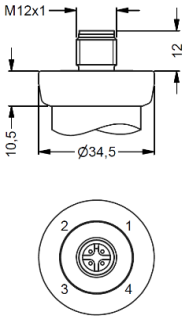
ISO 4400
(IP 65)



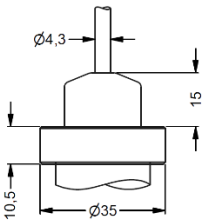
Binder series 723, 5-pin
(IP 67)



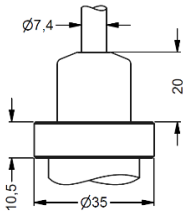
Binder series 723, 7-pin
(IP 67)



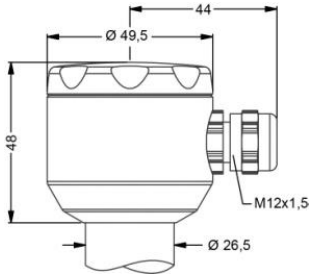
M12x1, 4-pin
(IP 67)



cable outlet with PVC cable
(IP 67) [13]



cable outlet, cable with
ventilation tube (IP 68) [14]

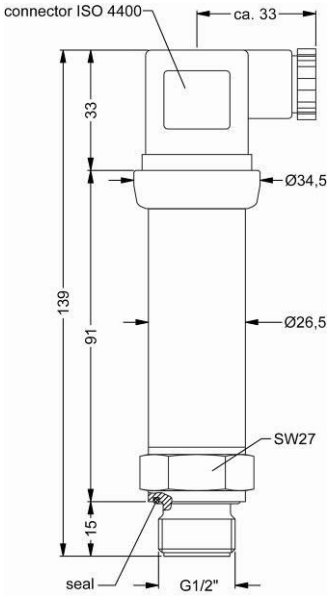


compact field housing
(IP 67)

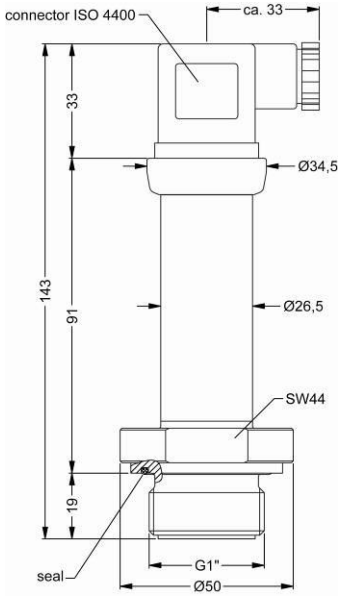
⇨ **universal field housing stainless steel 1.4404 (316 L) with cable gland M20x1.5 (ordering code 880) and other versions on request**

[13] *Standard: 2 m PVC-Kabel ohne Belüftungsschlauch (Temperatureinsatzbereich: -5 … 70°C)*
[14] *Kabel in verschiedenen Ausführungen und Längen lieferbar, Temperatureinsatzbereich abhängig vom Kabel*

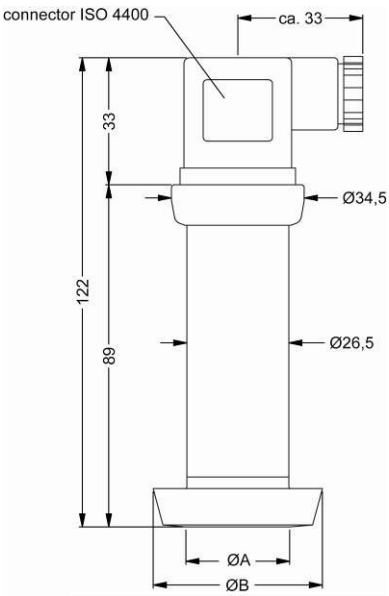
Mechanical connection (dimensions in mm)



G1/2" flush DIN 3852

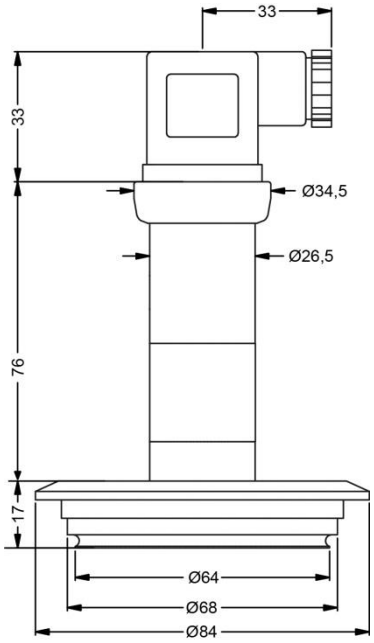


G1" flush DIN 3852

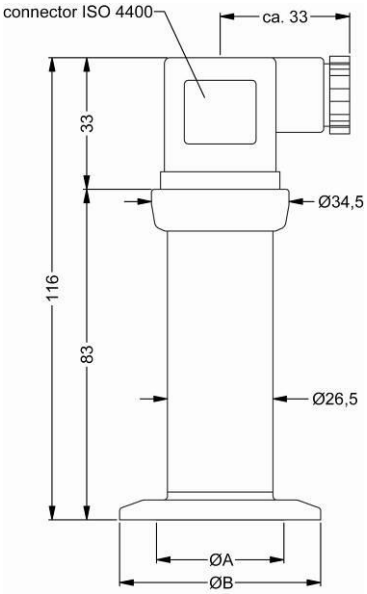


dairy pipe (DIN 11851)

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

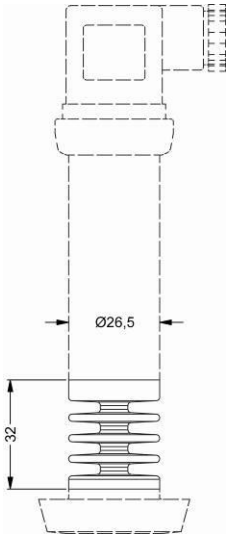


Varivent®
p_N ≤ 25 bar



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 [9]

⇨ **metric threads and others on request**

[9] max. temperature depends on the used sealing material, type of seal and installation
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BD|SENSORS pressure measurement

Ordering code DMP 331Pi

DMP 331Pi ☐☐☐ - ☐☐☐☐ - ☐ - ☐ - ☐☐☐ - ☐☐☐ - ☐ - ☐ - ☐ - ☐☐☐

Option	Code	Note
Pressure		
gauge	5 0 0	
absolute [1]	5 0 1	
Input [bar]		
0.4 [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	consult
0 … 10 V / 3-wire	3	
customer	9	consult
Accuracy		
0.1 % FSO	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) and female plug Binder series 423 (7-pin)	A 0 0	
cable outlet with PVC cable (IP67) [2]	T A 0	
cable outlet, cable with ventilation tube (IP68) [3]	T R 0	
male plug M12x1 (4-pin) / metal	M 1 0	
compact field housing stainless steel 1.4301 (304) [4]	8 5 0	
customer	9 9 9	consult
Mechanical connection		
G1/2" with flush welded diaphragm (DIN 3852) [5]	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) [4]	M 7 3	
dairy pipe DN 40 (DIN 11851) [4]	M 7 5	
dairy pipe DN 50 (DIN 11851) [4]	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 (FDA) / 3A	2	
customer	9	consult
Special version		
standard	1 1 1	
RS232 interface [6]	1 2 1	
with cooling element up to 300 °C	2 1 1	
RS232 interface and cooling element up to 300 °C [6]	2 2 1	
customer	9 9 9	consult

[1] absolute pressure possible from 1 bar
[2] standard: 2 m PVC cable without ventilation tube (permissible temperature: -5 ... 70 °C); others on request
[3] code TR0 = PVC cable, cable with ventilation tube available in different types and lengths
[4] 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.
[5] possible only for $p_N \geq 1$ bar
[6] RS232 interface only possible with electrical connection Binder series 723/423 (7-pin)
Software, Interface and cable for DMP 331 Pi with option RS232 have to be order separately
(Ordering code: CIS-G; Software appropriate for Windows® 95, 98, 2000, NT Version 4.0 or newer and XP)
Hastelloy® is a brand name of Haynes International Inc.; Varivent® is a brand name of GEA Tuchenhagen GmbH; Windows® is a registrated trademark of Microsoft Corporation

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