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

► communication interface for adjustment
of offset, span and damping

► IS-version (on request)

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

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 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 according to 21CFR178.3570 (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 1.4301 (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 > 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 (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 T85°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 ... 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	
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 million load 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)
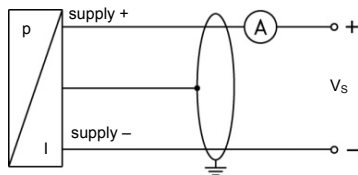
3-wire-system (voltage)
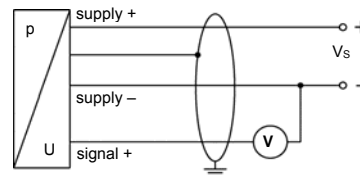
## Pin configuration

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

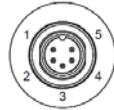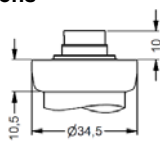[11] may not be connected directly with the PC (the suitable adapter is available as accessory)
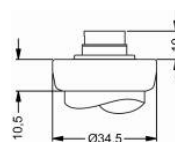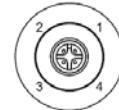
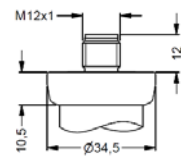## Electrical connections (dimensions in mm)
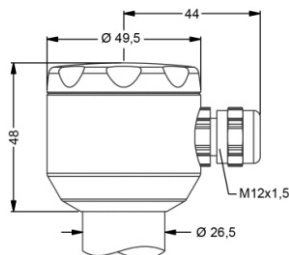
standard
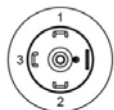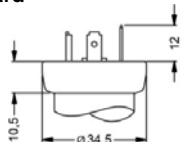
options

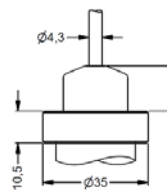ISO 4400 (IP 65)

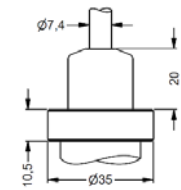Binder series 723 5-pin (IP 67)

Binder series 723 7-pin (IP 67)

M12x1 4-pin (IP 67)

compact field housing (IP 67)

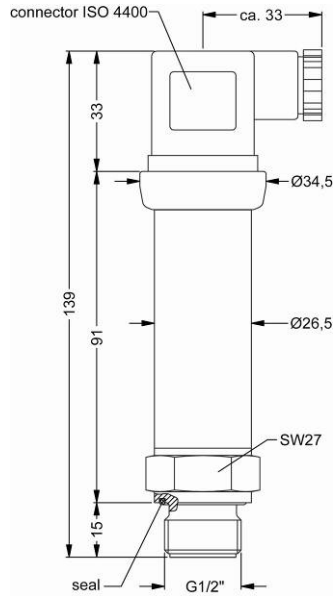cable outlet with PVC cable (IP 67) [12]

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

[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
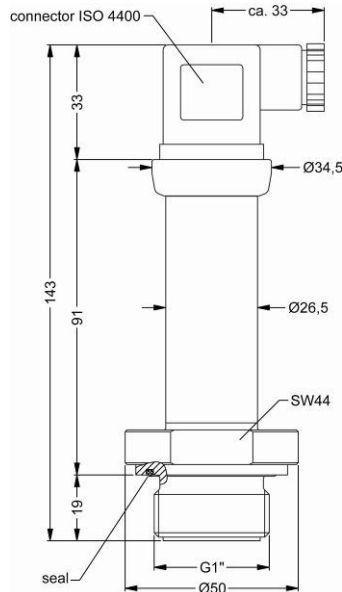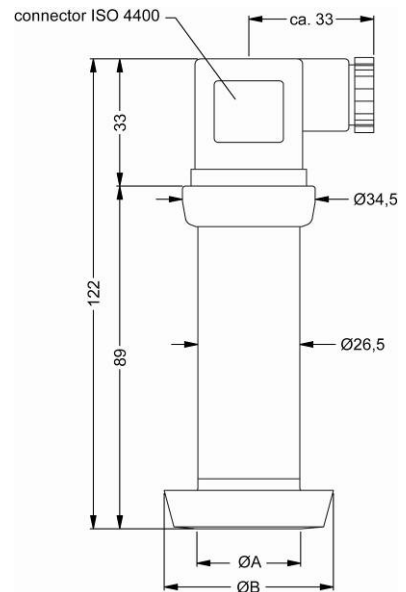
Mechanical connection (dimensions in mm)

standard

option

connector ISO 4400 — ca. 33
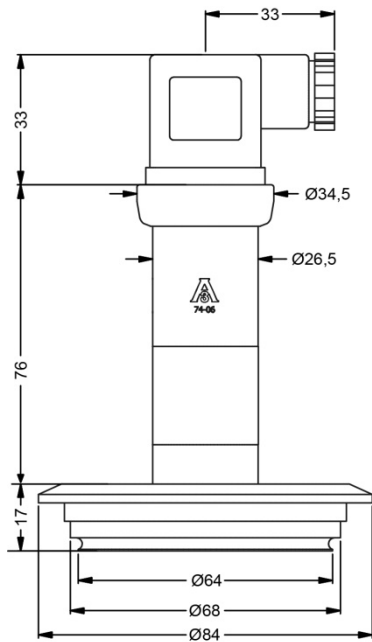
33

Ø34,5

139

91

Ø26,5

SW27

15

seal — G1/2"

G1/2" flush DIN 3852

connector ISO 4400 — ca. 33

33

Ø34,5

143

91

Ø26,5

SW44

19

seal — G1"
Ø50

G1" flush DIN 3852

connector ISO 4400 — ca. 33

33

Ø34,5

122

89

Ø26,5

ØA
ØB

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

33

33

Ø34,5

Ø26,5

74-06

76

17

Ø64
Ø68
Ø84

Varivent®
P_N ≤ 25 bar

connector ISO 4400 — ca. 33

33

Ø34,5

116

83

74-06

Ø26,5

ØA
ØB
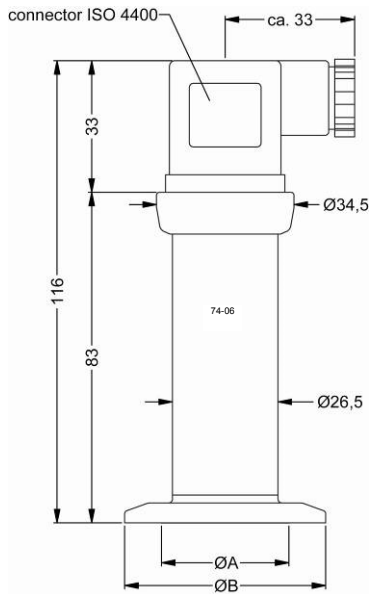
Clamp (DIN 32676)

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

Ø26,5

32
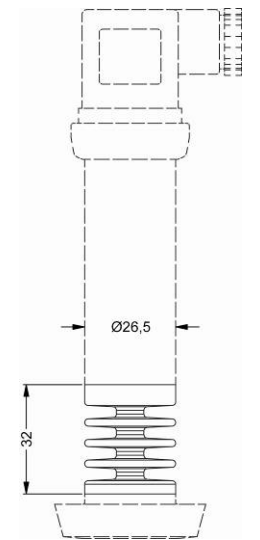
cooling element up to 300 °C

⇨ **metric threads and others on request**

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DMP331Pi_E_010919

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Ordering code DMP 331Pi

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Pressure

gauge [1]	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) [2]	A	0	0	
cable outlet with PVC cable (IP67) [3]	T	A	0	
cable outlet, cable with ventilation tube (IP68) [4]	T	R	0	
male plug M12x1 (4-pin) / metal	M	1	0	
compact field housing stainless steel 1.4301 (304) [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 (FDA) / 3A	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

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[1] absolut pressure possible from 1 bar

[2] cable socket is included in delivery

[3] standard: 2 m PVC cable without ventilation tube (permissible temperature: -5 … 70 °C), others on request

[4] cable with ventilation tube (code TR0 = PVC cable), different cable types and lengths available

[5] 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.

[6] possible only for P_N ≥ 1 bar

[7] 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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