



# IMP 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 IMP 331Pi demonstrates the further development of well-tried industrial pressure transmitter IMP 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



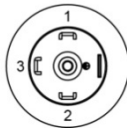
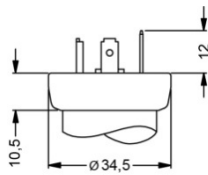
Pharmaceutical industry



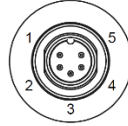
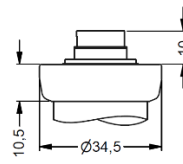
Pressure ranges <sup>1</sup>								
Nominal pressure gauge / absolute <sup>2</sup> [bar]	[bar]	0.4	1	2	4	10	20	40
Overpressure [bar]		2	5	10	20	40	80	105
Burst pressure ≥ [bar]		3	7.5	15	25	50	120	210
Vacuum resistance		p <sub>N</sub> ≥ 1 bar: unlimited vacuum resistance p <sub>N</sub> < 1 bar: on request						
<sup>1</sup> on customer request we adjust the device within the turn-down-possibility by software on the required pressure range								
<sup>2</sup> 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 <sub>S</sub> = 12 ... 36 V <sub>DC</sub>							
Option IS-version	2-wire: 4 ... 20 mA / V <sub>S</sub> = 14 ... 28 V <sub>DC</sub>							
Options	2-wire: 4 ... 20 mA with communication interface <sup>3</sup>							
	3-wire: 0 ... 10 V / V <sub>S</sub> = 14 ... 36 V <sub>DC</sub> 0 ... 10 V with communication interface <sup>3</sup>							
<sup>3</sup> only possible with electrical connection Binder series 723 (7-pin)								
Performance								
Accuracy <sup>4</sup> performance after turn-down - TD ≤ 1:5 - TD > 1:5	IEC 60770: ≤ ± 0.1 % FSO  no change of accuracy <sup>5</sup> 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 <sub>max</sub> = [(V <sub>S</sub> – V <sub>S min</sub> ) / 0.02 A] Ω      voltage 3-wire: R <sub>min</sub> = 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	current 2-wire: approx. 5 msec      voltage 3-wire: 25 msec							
Adjustability (option) <sup>6</sup>	configuration of following parameters possible (interface / software necessary): electronic damping: 0 ... 100 sec      offset: 0 ... 90 % FSO      turn down of span: max. 1:10							
<sup>4</sup> accuracy according to IEC 60770 – limit point adjustment (non-linearity, hysteresis, repeatability)								
<sup>5</sup> 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								
<sup>6</sup> adjustable version is only possible in combination with Binder Series 723, 7-pin; 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 <sup>7</sup> (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							
<sup>7</sup> 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 <sup>8</sup>	-40 ... 125 °C				-10 ... 125 °C			
Medium with cooling element <sup>9</sup>	overpressure: -40 ... 300 °C vacuum: -40 ... 150 °C <sup>10</sup>				overpressure: -10 ... 250 °C vacuum: -10 ... 150 °C <sup>10</sup>			
Electronics / environment	-25 ... 85 °C							
Storage	-40 ... 100 °C							
<sup>8</sup> max. temperature of the medium for nominal pressure gauge > 0 bar: 150 °C for 60 minutes with a max. environmental temperature of 50 °C								
<sup>9</sup> max. temperature depends on the used sealing material, type of seal and installation								
<sup>10</sup> also for p <sub>abs</sub> ≤ 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			

<b>Materials</b>						
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) Clamp, dairy pipe, Varivent®: without			others on request		
Diaphragm	standard: stainless steel 1.4435 (316L) option: Hastelloy® C-276 (2.4819) and Tantalum on request					
Media wetted parts	pressure port, diaphragm					
<b>Explosion protection (on request for 4 ... 20 mA / 2-wire)</b>						
Approvals DX19-IMP 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 <sub>i</sub> = 28 V, I <sub>i</sub> = 93 mA, P <sub>i</sub> = 660 mW, C <sub>i</sub> ≈ 0 nF, L <sub>i</sub> ≈ 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 <sub>atm</sub> 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					
<b>Miscellaneous</b>						
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 <sub>a</sub> < 0.8 μm (media wetted parts) diaphragm R <sub>a</sub> < 0.15 μm weld seam R <sub>a</sub> < 0.8 μm					
Weight	approx. 200 g					
Installation position	any <sup>11</sup>					
Operational life	100 million load cycles					
CE-conformity	EMC Directive: 2014/30/EU					
ATEX Directive	2014/34/EU					
<sup>11</sup> 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 <sub>N</sub> ≤ 1 bar.						
<b>Wiring diagrams</b>						
<b>2-wire-system (current)</b> 			<b>3-wire-system (voltage)</b> 			
<b>Pin configuration</b>						
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 <sup>12</sup>						
RxD	-	-	4	-	-	-
TxD	-	-	5	-	-	-
GND	-	-	7	-	-	-
<sup>12</sup> may not be connected directly with the PC (the suitable adapter is available as accessory)						

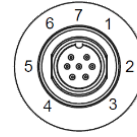
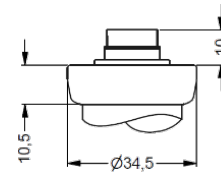
## Electrical connections (dimensions in mm)



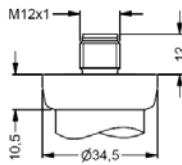
ISO 4400  
(IP 65)



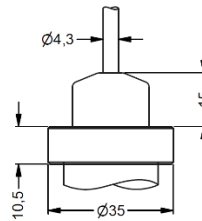
Binder series 723, 5-pin  
(IP 67)



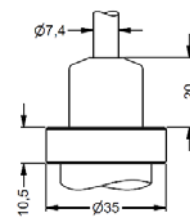
Binder series 723, 7-pin  
(IP 67)



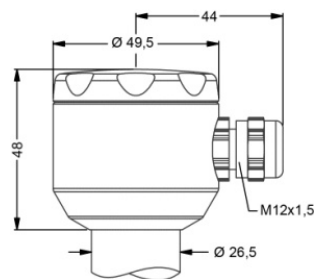
M12x1, 4-pin  
(IP 67)



cable outlet with PVC cable  
(IP 67) <sup>13</sup>



cable outlet, cable with  
ventilation tube (IP 68) <sup>14</sup>



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

<sup>13</sup> standard: 2 m PVC cable without ventilation tube (permissible temperature: -5 ... 70°C)

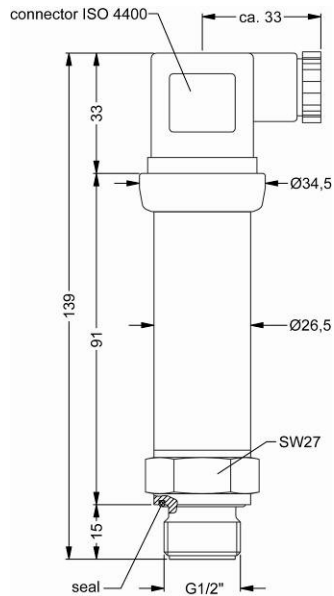
<sup>14</sup> different cable types and lengths available, permissible temperature depends on kind of cable

# IMP 331Pi

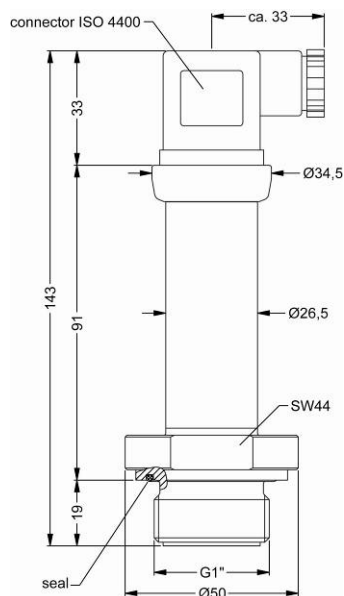
Precision Pressure Transmitter

Technical Data

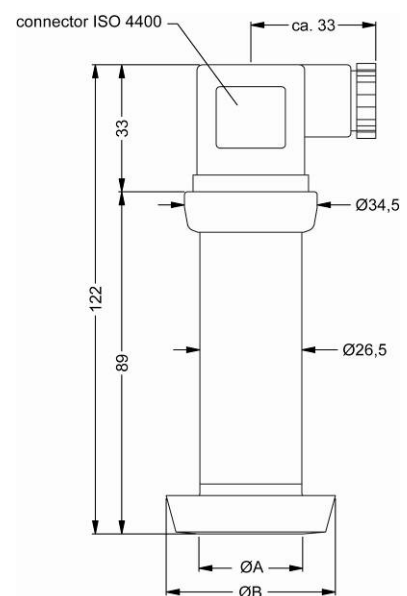
## Mechanical connection (dimensions in mm)



G1/2" flush DIN 3852

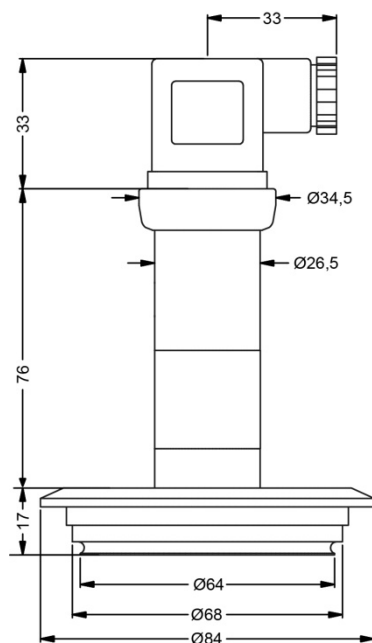


G1" flush DIN 3852

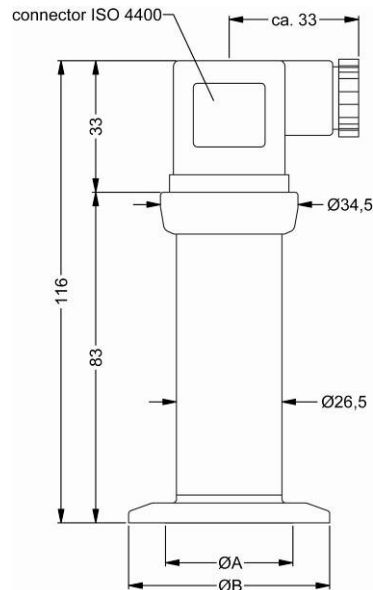


dairy pipe (DIN 11851)

dimensions in mm			
size	DN 25	DN 40	DN 50
A	23	32	45
B	44	56	68.5
p <sub>N</sub> [bar]	≤ 40	≤ 40	≤ 25

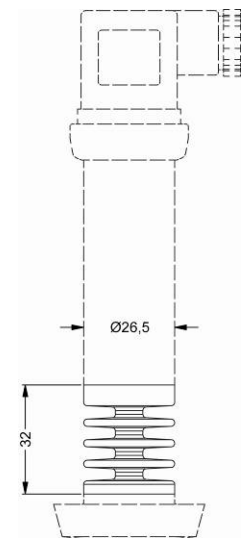


Varivent®  
p<sub>N</sub> ≤ 25 bar



Clamp (DIN 32676)

dimensions in mm			
size	DN 25	DN 32	DN 50
A	23	32	45
B	50.5	50.5	64
p <sub>N</sub> [bar]	≤ 16	≤ 16	≤ 16



cooling element up to 300 °C<sup>9</sup>

⇒ metric threads and others on request

<sup>9</sup> max. temperature depends on the used sealing material, type of seal and installation  
Windows® is a registered trade mark of Microsoft Corporation

# Ordering code IMP 331Pi

IMP 331Pi

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Pressure									
gauge	5	0	0						
absolute <sup>1</sup>	5	0	1						
Input									
[bar]									
0.4 <sup>1</sup>	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)	A	0	0						
and female plug Binder series 423 (7-pin)									
cable outlet with PVC cable (IP67) <sup>2</sup>	T	A	0						
cable outlet,									
cable with ventilation tube (IP68) <sup>3</sup>	T	R	0						
male plug M12x1 (4-pin) / metal	M	1	0						
compact field housing									
stainless steel 1.4301 (304) <sup>4</sup>	8	5	0						
customer	9	9	9						consult
Mechanical connection									
G1/2" with flush									
welded diaphragm (DIN 3852) <sup>5</sup>	Z	0	0						
G1" with flush									
welded diaphragm (DIN 3852)	Z	S	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						
dairy pipe DN 25 (DIN 11851) <sup>4</sup>	M	7	3						
dairy pipe DN 40 (DIN 11851) <sup>4</sup>	M	7	5						
dairy pipe DN 50 (DIN 11851) <sup>4</sup>	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								consult
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
RS232 interface <sup>6</sup>								1	2
with cooling element up to 300 °C								2	1
RS232 interface and									
cooling element up to 300 °C <sup>6</sup>								2	2
customer								9	9
									consult

<sup>1</sup> absolute pressure possible from 1 bar

<sup>3</sup> standard: 2 m PVC cable without ventilation tube (permissible temperature: -5 ... 70 °C); others on request

<sup>3</sup> code TR0 = PVC cable, cable with ventilation tube available in different types and lengths

<sup>4</sup> 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.

<sup>5</sup> possible only for  $p_N \geq 1$  bar

<sup>6</sup> RS232 interface only possible with electrical connection Binder series 723/423 (7-pin)

software, interface and cable for IMP 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)

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