OPTIBAR PM 5060 C

Technical Datasheet

Pressure transmitter for the measurement of process pressure, level, differential pressure, density and interface with metallic measuring cell

- Fully universal up to 1000 bar
- Broad selection of process connections also for hygienic applications
- Modular converter platform for all applications

KROHNE

1.1 OPTIBAR pressure transmitter

The OPTIBAR PM 5060 C features a fully welded metallic diaphragm that comes in a variety of materials. Front-flush process connections allow for gap-free installation, particularly for hygienic applications. A piezoresistive sensor element with internal transmission fluid is used for measuring ranges up to 40 bar / 580 psi. Starting at a measuring range of 100 bar / 1450 psi, a thin-film sensor element is used. It can measure the process pressure up to a measuring range of 1000 bar / 14503 psi on the backside of an Elgiloy® diaphragm without any additional filling liquid.

The OPTIBAR PM 5060 C is also used with diaphragm seals from the OPTIBAR DSP series.

Highlights

- Measuring range up to 1000 bar
- Fully welded metallic process diaphragm
- Flush mounted, hygienic process connections for the food industry
- Process temperatures up to 150°C / 392°F
- Extremely quick step response times < 85 ms
- Universal modularity of the entire OPTIBAR process series
- Display and adjustment module with optional bluetooth communication can be used for remote measured value indication, adjustments and diagnostics
- Quick start-up for all applications
- Extensive diagnostic and parameterisation functions on the display and adjustment module or the user-friendly DTM

Industries

- General process technology
- Power generation
- Chemical and petrochemical
- Environmental technology
- Water and wastewater
- Food and beverage
- Marine

Applications

- Level monitoring in food production
- Monitoring of supply pressure in pipelines
- Dry-run protection of delivery pumps
- Pressure monitoring of compressors

1.2 Options

The OPTIBAR process pressure series allows free choice of pressure sensors, process connections, electronics and housings - so that each device is perfectly adapted to each measuring task.

① The optional display and adjustment module makes it possible to start-up the converter on site. With double chamber housings it can be installed on the side.

② The converter can be configured using the optional display and adjustment module as well as via PACTware™ or the optionally available USB communicator. Regardless of the selected option, user guidance and navigation are absolutely identical.

There is a variety of converters available, which can be used regardless of the housing or sensor selected. In addition to the standard configuration with 2-wire 4...20 mA and HART® (version 7) signal, Foundation Fieldbus and Profibus PA can be selected depending on the application.

③ Note that not all approvals are available with all housings.

④ The OPTIBAR process pressure series comprises relative and absolute pressure sensors with metallic and ceramic measuring cells as well as a differential pressure measuring cell with metallic diaphragm for any application in industrial process measuring industry.

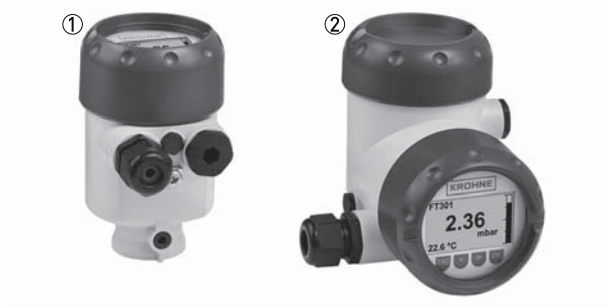


Figure 1-1: Plastic housing

① Single chamber
② Double chamber

The plastic housing is cost-effective and features a low net weight. Converters can only be used in hazardous areas in intrinsically safe operation.

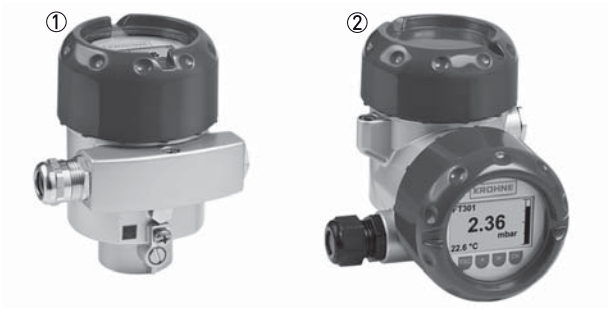


Figure 1-2: Aluminium housing

① Single chamber
② Double chamber

The standard housing for all pressure transmitters – it is perfectly equipped for industrial use and can be used in hazardous areas for all protection types.

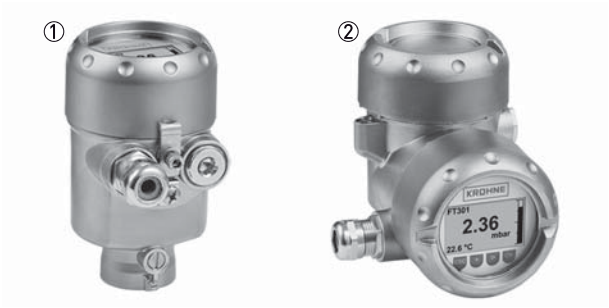


Figure 1-3: Stainless steel housing (precision casting)

① Single chamber
② Double chamber

For applications that place particular demands on the mechanical robustness of the converter. These housings can be used with all protection types for hazardous areas.

Figure 1-4: Stainless steel housing (electro-polished)

① Single chamber

Recommended for applications requiring the corrosion resistance of stainless steel but not the mechanical robustness of a stainless steel precision casting housing. Also suitable for hygienic applications that require an IP69K protection class for steam jet cleanings. Converters can only be used in hazardous areas in intrinsically safe operation.

1.3 Measuring principle

Relative pressure: The measuring cell is open to the atmosphere. The ambient pressure is referenced in the measuring cell and compensated and thus has no influence on the measurement.

Absolute pressure: The measuring cell is evacuated and enclosed. The process pressure is measured in reference to vacuum. Any change in the ambient pressure changes the measured value.

1.3.1 Piezoresistive measuring cell

The process pressure acts on the sensor element via the process diaphragm and an internal transfer fluid. The process pressure causes a resistance change, which is converted into an appropriate output signal and emitted as a measured value.

For measuring ranges up to and including 40 bar a piezoresistive sensor element is used.

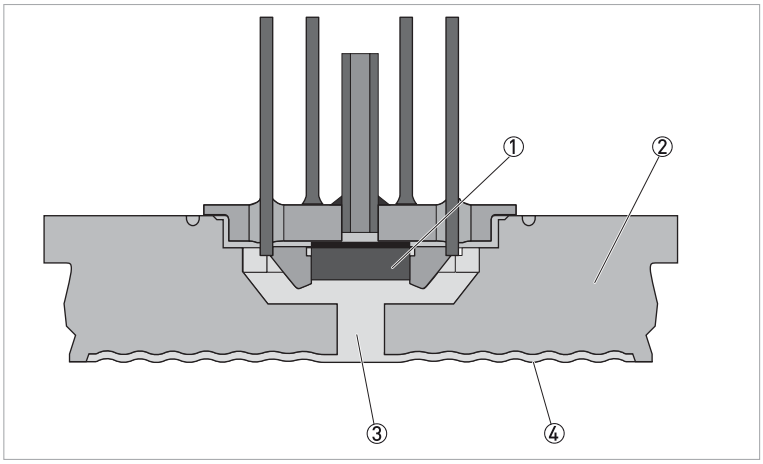


Figure 1-5: Setup of a piezoresistive measuring cell

① Sensor Element
② Base body
③ Transfer fluid
④ Process diaphragm

1.3.2 Strain gauge measuring cell

For pressure ranges from 40 bar a strain gauge sensor element (dry system) is used.

1.3.3 Metallic - ceramic measuring cell

For small measuring ranges or higher temperature ranges, a metallic-ceramic measuring cell is used. It consists of a special temperature compensating isolating diaphragm system with a metallic diaphragm in contact with the process medium and a ceramic sensor.

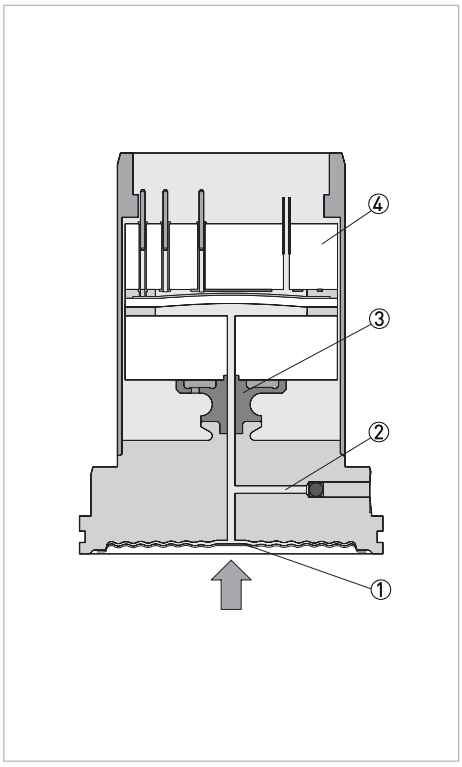


Figure 1-6: Setup of metallic-ceramic measuring cell

① Metallic process diaphragm
② Isolating liquid
③ FeNi adapter
④ Ceramic sensor

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

Measuring system

Measuring principle	• Piezoresistive measuring cell (Pn ≤ 40 bar / 580 psi) • Strain gauge measuring cell (Pn > 40 bar / 580 psi) • Metallic - ceramic measuring cell (Pn ≤ 25 bar / 363 psi)
Application range	• Process pressure measurement • Level of liquids • Differential pressure measurement ① • Density measurement ① • Interface measurement ①
Measuring range	100 mbar...1000 bar / 1.45...14500 psi
Display and user interface	
Local control	Operation via 4 push buttons on the display and adjustment module
Display and adjustment module	• Indication of measured value or derived measured value such as filling height • Quick start adjustment and extended adjustment of all parameters • Warning and diagnostic information
Remote control	• Bluetooth® via OPTICHECK Pressure Mobile application available in Google Play Store and Apple App Store • PACTware™, incl. Device Type Manager (DTM) • HART®Hand Held Communicator • AMS® from Emerson Process • PDM® from Siemens
Operating and display languages	German, English, French, Spanish, Portuguese, Italian, Dutch, Russian, Turkish, Polish, Czech, Chinese and Japanese
Integrated clock	
Date format	Day / Month / Year
Time format	12 hours / 24 hours
Time zone	CET (Factory setting)
Rate deviation	Maximum 10.5 minutes / year
① Only available for electronic differential pressure when the slave sensor is activated	

Measuring accuracy

<table>
<tr><td colspan="5">Process pressure</td></tr>
<tr><td>Reference conditions acc. to DIN 61298-1</td><td colspan="4">• Ambient temperature (constant): +18...+30°C / +64...+86°F
• Relative humidity (constant): 45...75%
• Ambient pressure (constant): 860...1060 mbar / 86...106 kPa / 12.5...15.4 psi
• Measuring accuracy according to IEC 61298-2 (terminal based)
• Curve characteristic: linear
• Vertical mounting position, measuring diaphragm pointing down
• Effect of mounting position (piezoresistive or strain gauge measuring cell): Depending on process connection and diaphragm seal system (a position-dependent zero offset can be corrected)
• Effect of mounting position (metallic-ceramic measuring cell): < 5 mbar / 0.5 kPa / 0.07 psig (a position-dependent zero offset can be corrected)
• Deviation in the current output due to strong, high-frequency electromagnetic fields acc. to EN 61326-1 <± 150 µA</td></tr>
<tr><td rowspan="4">Reference accuracy acc. to DIN EN 60770

(different availability depending on measuring range and process connection)</td><td colspan="4">Includes the non-linearity, hysteresis and repeatability under reference conditions. Applies to the digital interfaces (HART®, Profibus PA, Foundation Fieldbus) as well as for the analogue 4…20 mA current output. Turn down (TD) is the relation of nominal range/set measuring span. [% of the set span]</td></tr>
<tr><td>Accuracy class</td><td>0.075%</td><td>0.10%</td><td>0.20%</td></tr>
<tr><td>TD of 1:1 to 5:1</td><td>< ±0.075</td><td>< ±0.10</td><td>< ±0.20</td></tr>
<tr><td>TD > 5:1</td><td>< ±0.015 x TD</td><td>< ±0.02 x TD</td><td>< ±0.04 x TD</td></tr>
<tr><td rowspan="5">Effect of ambient / process temperature piezoresistive or strain gauge measuring cell</td><td colspan="4">Ambient temperature effect on zero and span in relation to the set measuring range. Applies to the digital interfaces (HART®, Foundation Fieldbus, Profibus PA) as well as for the analogue 4...20 mA current output.
[% of the set span per 28°C / 50°F]
All performance characteristics are in conformance with ≥ ± 3-sigma</td></tr>
<tr><td>Accuracy class</td><td>-40…0°C / -40…+32°F</td><td>0…+100°C / +32…+212°F</td><td>+100…+150°C / +212…+302°F</td></tr>
<tr><td>0.075%
0.1%</td><td>0.14 x TD + 0.14</td><td>0.105 x TD + 0.105
max. 0.075 x TD + 0.075 ①</td><td>0.14 x TD + 0.14</td></tr>
<tr><td>0.2%</td><td>0.42 x TD + 0.42</td><td>0.315 x TD + 0.315
max. 0.225 x TD + 0.225 ①</td><td>0.42 x TD + 0.42</td></tr>
<tr><td colspan="4">① Maximum value apply for the entire temperature intervall.</td></tr>
<tr><td rowspan="5">Effect of ambient / process temperature ceramic-metallic measuring cell</td><td colspan="4">Ambient temperature effect on zero and span in relation to the set measuring span. Applies to the digital interfaces (HART®, Profibus PA, Foundation Fieldbus) as well as for the analogue 4…20 mA current output.
[% of the set span per 28°C / 50°F]
All performance characteristics are in conformance with ≥ ± 3-sigma</td></tr>
<tr><td>Accuracy class</td><td>-40…0°C / -40…+32°F</td><td>0…+100°C / +32…+212°F</td><td>+100…+150°C / +212…+302°F</td></tr>
<tr><td>0.075%
0.1%</td><td>0.21 x TD + 0.21</td><td>0.105 x TD + 0.105
max. 0.075 x TD + 0.075 ①</td><td>0.07 x TD + 0.07</td></tr>
<tr><td>0.2%</td><td>0.63 x TD + 0.63</td><td>0.315 x TD + 0.315
max. 0.225 x TD + 0.225 ①</td><td>0.21 x TD + 0.21</td></tr>
<tr><td colspan="4">① Maximum value apply for the entire temperature intervall.</td></tr>
</table>

<table>
<tr><td rowspan="6">Effect of ambient / process temperature for climate compensated version of the ceramic-metallic measuring cell</td><td colspan="4">Ambient temperature effect on zero and span in relation to the set measuring range. Applies to the digital interfaces (HART®, Foundation Fieldbus, Profibus PA) as well as for the analogue 4...20mA current output.
[% of the set span per 28°C / 50°F]
All performance characteristics are in conformance with ≥ ± 3-sigma</td></tr>
<tr><td>Measuring range</td><td>-40…0°C / -40…+32°F</td><td>0…+100°C / +32…+212°F</td><td>+100…+150°C / +212…+302°F</td></tr>
<tr><td>10 bar, 25 bar</td><td>0.14 x TD + 0.14</td><td>0.105 x TD + 0.105
max. 0.075 x TD + 0.075 ①</td><td>0.14 x TD + 0.14</td></tr>
<tr><td>1 bar, 2.5 bar</td><td>0.28 x TD + 0.28</td><td>0.21 x TD + 0.21
max. 0.15 x TD + 0.15 ①</td><td>0.28 x TD + 0.28</td></tr>
<tr><td>0.4 bar</td><td>0.42 x TD + 0.42</td><td>0.315 x TD + 0.315
max. 0.225 x TD + 0.225 ①</td><td>0.42 x TD + 0.42</td></tr>
<tr><td colspan="4">① Maximum value apply for the entire temperature intervall.</td></tr>
<tr><td rowspan="9">Long-term stability acc. to DIN 16086 and IEC 60770-1</td><td colspan="3">Applies to the digital interfaces (HART®, Profibus PA, Foundation Fieldbus) as well as for the analogue 4…20 mA current output.
[% of URL]</td></tr>
<tr><td colspan="3">Piezoresistive / Strain gauge measuring cell</td></tr>
<tr><td colspan="2">Measuring ranges > 1 bar</td><td><± 0.1 x TD/year</td></tr>
<tr><td colspan="2">Measuring ranges > 1 bar, isolating liquid, synthetic oil, diaphragm Elgiloy (2.4711)</td><td><± 0.15 x TD/year</td></tr>
<tr><td colspan="2">Measuring range 1 bar</td><td><± 0.15 x TD/year</td></tr>
<tr><td colspan="2">Measuring range 0.4 bar</td><td><± 0.35 x TD/year</td></tr>
<tr><td colspan="3">Metallic-ceramic measuring cell (for gold-coated diaphragm, the values need to be multiplied with factor 3)</td></tr>
<tr><td colspan="2">One year</td><td><± 0.05 x TD</td></tr>
<tr><td colspan="2">Five years</td><td><± 0.1 x TD</td></tr>
<tr><td colspan="2">Ten years</td><td><± 0.2 x TD</td></tr>
<tr><td colspan="4">Electronics temperature</td></tr>
<tr><td colspan="4">The evaluation is made by using the display and adjustment module for indication, the current output and additional current output for analogue signal output and HART®, Profibus PA and Foundation Fieldbus for digital signal output.</td></tr>
<tr><td>Operating temperature / nominal temperature range</td><td colspan="3">-40…+85°C / -40…+185°F</td></tr>
<tr><td>Resolution</td><td colspan="3"><0.1 K</td></tr>
<tr><td>Accuracy at -40…+85°C / -40…+185°F</td><td colspan="3"><±3 K</td></tr>
</table>

Operating conditions

<table>
<tr><td colspan="6">Temperature</td></tr>
<tr><td>Version</td><td colspan="2">Ambient temperature</td><td colspan="3">Storage and transport temperature</td></tr>
<tr><td>Standard version</td><td colspan="2">-40...+80°C / -40...+176°F</td><td colspan="3">-60...+80°C / -76...+176°F</td></tr>
<tr><td>IP66 / IP68 version (1 bar / 14.5 psi)</td><td colspan="2">-20...+80°C / -4...+176°F</td><td colspan="3">-20...+80°C / -4...+176°F</td></tr>
<tr><td>IP68 version (25 bar / 362 psi), connection cable PUR</td><td colspan="2">-20...+80°C / -4...+176°F</td><td colspan="3">-20...+80°C / -4...+176°F</td></tr>
<tr><td>IP68 version (25 bar / 362 psi), connection cable PE</td><td colspan="2">-20...+60°C / -4...+140°F</td><td colspan="3">-20...+60°C / -4...+140°F</td></tr>
<tr><td colspan="6">Process temperature piezoresistive / strain gauge measuring cell</td></tr>
<tr><td rowspan="2">Seal</td><td colspan="5">Sensor version</td></tr>
<tr><td>Standard</td><td>Extended temperature range</td><td colspan="2">Hygienic connections</td><td>Version for oxygen applications</td></tr>
<tr><td></td><td colspan="2">$p_{abs} \geq 1$ mbar</td><td>$p_{abs} \geq 1$ mbar</td><td>$p_{abs} \geq 10$ mbar</td><td>$p_{abs} \geq 10$ mbar</td></tr>
<tr><td>Without consideration of the seal (Process connections acc. to DIN 3852-A, EN 837)</td><td>-40...+105°C / -40...+221°F
or
-20...+105°C / -4...+221°F</td><td>-</td><td>-</td><td>-</td><td>-20...+60°C / -4...+140°F</td></tr>
<tr><td>FKM (VP2/A)</td><td rowspan="2">-20...+105°C / -4...+221°F</td><td rowspan="2">-20...+150°C / -4...+302°F</td><td rowspan="2">-20...+85°C / -4...+185°F</td><td rowspan="2">-20...+150°C / -4...+302°F</td><td rowspan="2"></td></tr>
<tr><td>EPDM (A+P 70.10-02)</td></tr>
<tr><td>FFKM (Perlast® G75S)</td><td>-15...+105°C / +5...+221°F</td><td>-15...+150°C / +5...+302°F</td><td>-15...+85°C / +5...+185°F</td><td>-15...+150°C / +5...+302°F</td><td>-15...+60°C / +5...+140°F)</td></tr>
<tr><td>FEPM (Fluoraz® SD890)</td><td>-5...+105°C / +23...+221°F</td><td>-</td><td>-</td><td>-</td><td>-5...+60°C / +23...+140°F</td></tr>
<tr><td colspan="6">Temperature derating piezoresistive / strain gauge measuring cell</td></tr>
<tr><td>Version</td><td colspan="2">Process temperature</td><td colspan="3">Ambient temperature</td></tr>
<tr><td rowspan="2">+105°C / +221°F</td><td colspan="2">+85°C / +185°F</td><td colspan="3">+80°C / +176°F</td></tr>
<tr><td colspan="2">+105°C / +221°F</td><td colspan="3">+40°C / +104°F</td></tr>
<tr><td rowspan="2">+150°C / +302°F</td><td colspan="2">+85°C / +185°F</td><td colspan="3">+80°C / +176°F</td></tr>
<tr><td colspan="2">+150°C / +302°F</td><td colspan="3">+40°C / +104°F</td></tr>
<tr><td colspan="6">SIP process temperature (SIP = Sterilisation in place)</td></tr>
<tr><td>Vapour stratification for 2 hour</td><td colspan="5">+150°C / +302°F (Instrument configuration suitable for vapour)</td></tr>
<tr><td colspan="6">Process temperature metallic-ceramic measuring cell</td></tr>
<tr><td rowspan="2">Version</td><td colspan="5">Temperature range</td></tr>
<tr><td>$p_{abs} \geq 50$ mbar</td><td colspan="2">$p_{abs} \geq 10$ mbar</td><td colspan="2">$p_{abs} \geq 1$ mbar</td></tr>
<tr><td>Standard</td><td colspan="2">-12...+150°C / +10...+284°F</td><td colspan="2" rowspan="3">-12...+120°C / +10...+248°F</td></tr>
<tr><td>Extended temperature range</td><td>-12...+180°C / +10...+356°F</td><td colspan="2" rowspan="2">-12...+160°C / +10...+320°F</td></tr>
<tr><td>-12...+200°C / +10...+392°F</td></tr>
</table>

Temperature derating metallic-ceramic measuring cell		
Version	Process temperature	Maximum ambient temperature
+150°C / +302°F	+110°C / +230°F	+80°C / +176°F
	+150°C / +302°F	+60°C / +140°F
+180°C / +356°F	+150°C / +302°F	+80°C / +176°F
	+180°C / +356°F	+65°C / +149°F
+200°C / +392°F	+160°C / +320°F	+80°C / +176°F
	+200°C / +392°F	+65°C / +149°F

Further operating conditions

Housing material	**Version**	**Protection acc. to IEC 60529**	**Protection acc. to NEMA**
Plastic (PBT)	Single chamber	IP66 / IP67	Type 4X
	Double chamber		
Aluminium	Single chamber	IP66 / IP67	Type 4X
		IP68 (1 bar / 14.5 psi)	-
	Double chamber	IP66 / IP67	Type 4X
Stainless steel (electro-polished)	Single chamber	IP66 / IP67	Type 4X
		IP69K	
Stainless steel (precision casting)	Single chamber	IP66 / IP67	Type 4X
		IP68 (1 bar / 14.5 psi)	-
	Double chamber	IP66 / IP67	Type 4X
Stainless steel	Transmitter, version with external housing	IP68 (25 bar / 363 psi)	-
Connection of the feeding power supply unit	Networks of overvoltage category III		
Altitude above sea level			
by default	up to 2000 m (6562 ft)		
with connected overvoltage protection	up to 5000 m (16404 ft)		
Pollution degree	2 (when used with fulfilled housing protection)		
Protection rating (IEC/EN 61010-1)	II		

Mechanical stress piezoresistive / strain gauge measuring cell				
Version	Without cooling zone		With cooling zone	
	All housing versions	Double chamber stainless steel housing	All housing versions	Double chamber stainless steel housing
Vibration resistance 1 to 4 g at 5...200 Hz according to EN 60068-2-6 (vibration with resonance)	4 g (GL characteristics 2)	0.7 g (GL characteristics 1)	4 g (GL characteristics 2)	0.7 g (GL characteristics 1)
Shock resistance 2.3 ms according to EN 60068-2-27 (mechanical shock)	50 g		50 g	20 g
Mechanical stress metallic-ceramic measuring cell (depending on the instrument version)				
Reference conditions	Single chamber housing, aluminium			
Vibration resistance acc. to EN 60068-2-6	1...4 g at 5...200 Hz (vibration with resonance)			
Shock resistance acc. to EN 60068-2-27	50 g, 2.3 ms (mechanical shock), 2 g with double chamber housing, stainless steel			

Materials

Wetted parts (piezoresistive / strain gauge measuring cell)		
Process connection	316L / 1.4404	
Diaphragm	316L / 1.4435	
Diaphragm for measuring range from 100 bar	Elgiloy® 2.4711	
Gasket for process connection (included in the scope of delivery)	Thread G1/2 (EN 837)	Klingersil® C-4400
	Thread G1 1/2 (DIN 3852)	Klingersil® C-4400
	M44 x 1.25 (DIN 13)	FKM, FFKM and EPDM
	M30 x 1.5 (DIN 13)	FKM, FFKM and EPDM
	FKM (VP2/A), EPDM (A+P 70.10-02), FFKM (Perlast® G75S), FEPM (Fluoraz® SD890)	
Wetted parts (metal-ceramic measuring cell)		
Process connection	316L / 1.4404	
Diaphragm	Alloy C-276 / 2.4819, optional: gold coated 20 µ, gold/rhodium coated 5 µ/1 µ (not on instruments with SIL qualification)	
Piezoresistive or strain gauge measuring cell	Pressure port with inner diaphragm • Synthetic oil KN 77 ≤ 40 bar / 4MPa / 580 psi • Halocarbon oil 6.3 KN 21 for oxygen applications ≤ 40 bar / 4MPa / 580 psi (not with vacuum measuring ranges and absolute measuring ranges < 1 bar / 100 kPa / 14.5 psi) • Dry measuring cell (without fill fluid) for pressure ranges > 40 bar / 4MPa / 580 psi	
	Pressure ports with flush diaphragm • Synthetic oil KN 77 for G1/2" and G1" process connections (LU, P6, C5) • Neobee oil M 20 KN 59 (FDA conform) up to 250 bar	
Metallic-ceramic measuring cell	KN 92 medical white oil (FDA conform)	
Gasket for process connection (included in the scope of delivery)	Klingersil® C-4400	

Thread G1/2 (EN 837)	Klingersil® C-4400
Thread G1 1/2 (DIN 3852)	Klingersil® C-4400
M44 x 1.25 (DIN 13)	FKM, FFKM and EPDM
Surface quality, hygienic process connections	typ. R_a< 0.8 µm
Materials non-wetted parts	
Sensor housing	Plastic PBT (Polyester), Aluminium AlSi10Mg low copper content <0.4% (powder-coated, basis: Polyester), 316L
Cable gland	PA, stainless steel, brass
Cable gland: Seal, closure	NBR, PA
Seal, housing lid	Silicone SI 850 R, NBR silicone-free
Inspection window housing cover	Polycarbonate (UL-746-C listed), glass with Aluminium and stainless steel precision casting housing
Ground terminal	316L
External housing - deviating materials	
Housing and socket	Plastic PBT (Polyester), 316L
Socket seal	EPDM
Seal below wall mounting plate (Only for 316L with 3A approval)	EPDM
Inspection window housing cover	Polycarbonate (UL-746-C listed)
Ground terminal	316Ti / 316L
Connection cable with IP 68 (25 bar) between transmitter and external electronics housing	
Cable cover	PE, PUR
Type label support on cable	PE hard
Connection cable with IP 68 (1 bar) fix connected to the sensor.	PE, PUR

Process connection

Thread	from G1/2 and 1/2-14 NPT (female)
Flanges	from DN 25 (DIN / EN) / 1" (ASME)
Flanges with extension	from DN 25 (DIN / EN) / 1" (ASME)
Other connections	ISO 2852 / DIN 32676, DIN 11851, Neumo BioConnect / BioControl, Varivent, DRD, SMS and PMC
Maximum tightening torques for metric process connections	
G1/4, G1/2	50 Nm / 36.88 ft lb
G1/2 front-flush, G1 front-flush	40 Nm / 29.5 ft lb
G1 1/2 front-flush (piezoresistive measuring cell)	40 Nm / 29.5 ft lb

G1 1/2 front-flush (ceramic/metallic measuring cell)	200 Nm / 147.5 ft lb
Maximum tightening torques for non-metric process connections	
1/2 NPT inside, 1/4 NPT, ≤ 40 bar/500 psig	50 Nm / 36.88 ft lb
1/2 NPT inside, 1/4 NPT, > 40 bar/500 psig	200 Nm / 147.5 ft lb
7/16 NPT for tube 1/4"	40 Nm / 29.5 ft lb
9/16 NPT for tube 3/8"	50 Nm / 36.88 ft lb
Maximum tightening torques for NPT cable glands and conduit pipes	
Plastic housing	10 Nm / 7.376 lbf ft
Aluminium housing	50 Nm / 36.88 ft lb
Stainless steel housing	50 Nm / 36.88 ft lb

Electrical connections

Mechanical - Standard				
Cable entry	M20 x 1.5, 1/2-14 NPT			
Cable gland	M20 x 1.5, 1/2-14 NPT			
Blind plug	M20 x 1.5, 1/2-14 NPT			
Closing cap	M20 x 1.5, 1/2-14 NPT			
Connector option	M12 x 1, Harting HAN 7D, 8D, 7/8" FF			
Material cable gland / Seal insert	Cable diameter			
	5…9 mm / 0.20...0.35"	6…12 mm / 0.24...0.47"	7...12 mm / 0.27...0.47"	10…14 mm / 0.39...0.55"
PA / NBR	X	X	-	X
Brass, nickel-plated / NBR	X	X	-	-
Stainless steel / NBR	-	-	X	-
Wire cross-section (spring-loaded terminals)				
Massive wire, stranded wire	0.2...2.5 mm² (AWG 24...14)			
Stranded wire with end sleeve	0.2...1.5 mm² (AWG 24...16)			
Mechanical - Display and adjustment module				
Display element	Display with backlight turnable in 90° steps			
Measured value indication	5 digits (13x7 mm / 0.51x0.27")			
Adjustment elements	4 keys [OK], [->], [+], [ESC]			
Bluetooth interface (optional)	Bluetooth LE 4.1			
	Max. participants 1			
	Effective range typ. 25 m / 82 ft (depending on the local conditions)			
	Bluetooth Switch [On], [Off]			
Protection rating	Unassembled IP20			
	Mounted in the housing without lid IP40			

Materials	ABS Housing
	Polyester foil inspection window
Functional safety	SIL non-reactive
Ambient temperatures below -20°C / -4°F may affect the readability of the display	
Mechanical - IP66 / IP68 (1 bar)	
Connection cable	
Structure of connecting cable	Four wires, one pressure compensation capillary, one suspension cable, screen braiding, metal foil and cable jacket
Wire cross-section	0.5 mm^2 / AWG 20
Wire resistance	0.037 Ω/m / 0.012 Ω/ft
Standard length	5 m / 16.40 ft
Max. length	180 m / 590.5 ft
Min. bending radius	25 mm / 0.98" at 25°C / 77°F
Diameter	ca. 8 mm / 0.31"
Material	PE (black)
	PUR (blue)
Mechanical - Electronic differential pressure measurement	
Connection cable between master and slave sensor	
Data transfer	Digital (I²C bus)
Structure of connecting cable	Four wires, one suspension cable, screen braiding, metal foil, cable jacket
Wire cross-section	0.34 mm² / AWG 22
Wire resistance	< 0.05 Ω/m / 0.015 Ω/ft
Standard length	5 m / 16.40 ft
Max. length	25 m / 82 ft
Min. bending radius	25 mm / 0.98" at 25°C / 77°F
Diameter	ca. 8 mm / 0.31"
Material	PE (black) PUR (blue)
Mechanical - IP68 (25 bar)	
Connecting cable between IP68 device and external housing	
Construction	Four wires, one pressure compensation capillary (not with Ex d version), one suspension cable, screen braiding, metal foil and cable jacket
Wire cross-section	0.5 mm^2 / AWG 20
Wire resistance	0.037 Ω/m / 0.012 Ω/ft
Standard length	5 m / 16.40 ft
Max. length	180 m / 590.5 ft
Min. bending radius	25 mm / 0.98" at 25°C / 77°F
Diameter	ca. 8 mm / 0.31"
Material	PE (black) PUR (blue)
Cable entry / Connector	
External housing	1 x cable gland M20 x 1.5 (cable Ø 5...9 mm), 1 x blind plug M20 x 1.5
	1 x connector (depending on version), 1 x blind plug M20 x 1.5

Spring load terminals for wire cross-section up to	2.5 mm^2 / AWG 14	
Electrical		
Operating voltage	Non-Ex device: 9.6...35 VDC	
	Ex ia device: 9.6...30 VDC	
	Ex d device: 9.6...35 VDC	
	Background lighting on display from 16 VDC	
	Electronic differential pressure from 12 VDC	
Reverse polarity protection	Integrated	
Permissible residual ripple	Non-Ex devices	for U_n 12 VDC (9.6 VDC < U_B < 14 VDC) ≤ 0.7 V_{eff} (16...400 Hz) for U_n 24 VDC (18 VDC < U_B < 35 VDC) ≤ 1.0 V_{eff} (16...400 Hz)
	Ex ia d devices and Ex ia devices	for U_n 24 VDC (18 VDC < U_B < 35 VDC) ≤ 1.0 V_{eff} (16...400 Hz)
Load	$R_{L, max}$ = (U_B-9.6) / 22 mA	
Potential connections and electrical separating measures in the instrument	Electronics: Not electrically isolated	
	Reference voltage: 500 V AC (galvanic separation between electronics and metal housing parts)	
	Conductive connection: Between ground terminal and metallic process connection	
Over voltage category	III	
Protection class	II	

Output signal

Output signal	4...20 mA / HART® version 7.3 3.8...20.5 mA / HART® version 7.3 (factory setting acc. to NAMUR recommendation)	
Signal resolution	0.3 µA	
Error signal of current output (adjustable)	High alarm ≥ 21 mA Low alarm ≤ 3.6 mA Last valid measured value (not possible with SIL)	
Max. output current	21.5 mA	
Switch-on phase	Run-up time with operating voltage U_B:	≥ 12 VDC ≤ 9 s
		< 12 VDC ≤ 22 s
	Starting current:	≤ 10 mA for 5 ms after switching on, then ≤ 3.6 mA
Additional current output (optional)		
Output signal	4…20 mA (passive)	
Range of the output signal	3.8…20.5 mA (default setting)	
Signal resolution	0.3 µA	
Error signal of second current output (adjustable)	High alarm ≥ 21 mA Low alarm ≤ 3.6 mA Last valid measured value (not possible with SIL)	
Max. output current	21.5 mA	
Starting current	≤ 10 mA for 5 ms after switching on, ≤ 3.6 mA	
Load	Load resistor, see chapter "Voltage supply"	

Approvals and certificates

CE	The device complies with the legal requirements of the EC directive. The manufacturer confirms compliance with these regulations by affixing the CE marking.
Electromagnetic compatibility (EMC)	EMC conformity for EN 61326-1:2013, EN 61326-2-3:2013, EN 61326-2-5:2013, EN 61326-3-2:2008
NAMUR	NE 21 - Electromagnetic compatibility of equipment NE 43 - Signal level for the failure information of digital transmitters NE 53 - Compatibility of field devices and display/adjustment components NE 107 - Self-monitoring and diagnosis of field devices
Classification according to Pressure Equipment Directive (PED 2014/68/EU)	For gases of fluid group 1 and liquids of fluid group 1, the requirements are fulfilled according to article 4, paragraph (3) (sound engineering practice).

2.2 Dimensions and weight

The following dimensional drawings represent only an extract of the possible versions. Detailed dimensional drawings can be requested individually.

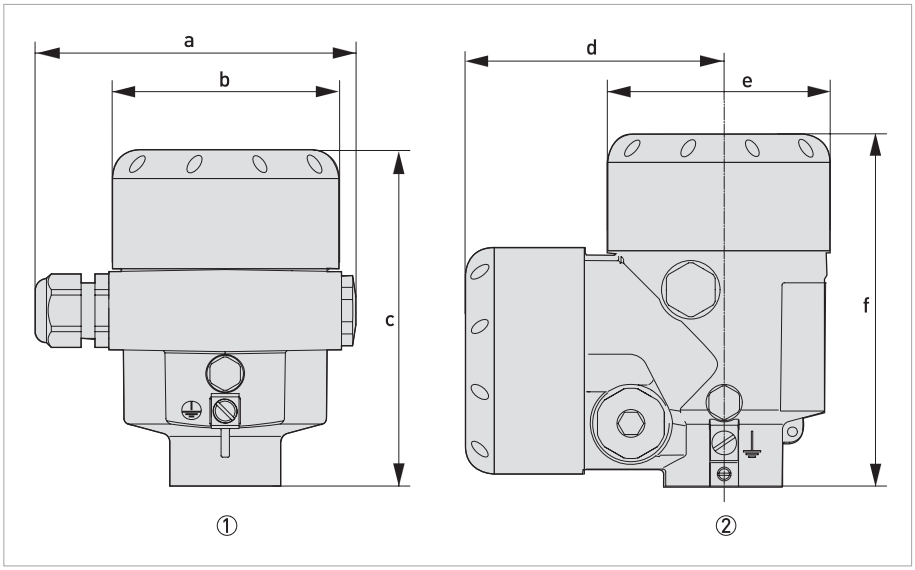


Figure 2-1: Aluminium housing

① Single chamber
② Double chamber

	Dimension [mm]	Dimension [inch]
a	116	4.57
b	86	3.39
c	116	4.57
d	87	3.43
e	86	3.39
f	120	4.72

With integrated display and adjustment module the height of the housing increases by 18 mm / 0.71 inch.

Housing version	Weight [kg]	Weight [lb]
Single chamber, aluminium	0.83	1.84
Double chamber, aluminium	1.24	2.73

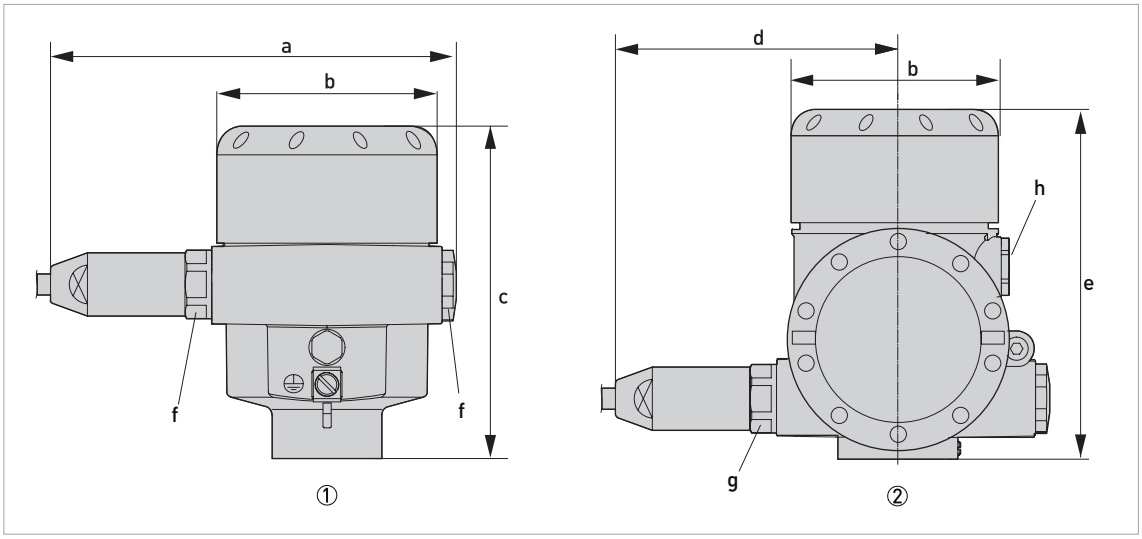


Figure 2-2: Aluminium housing in IP66 / IP68 (1 bar) version

① Single chamber
② Double chamber

	Dimension [mm]	Dimension [inch]
a	150	5.91
b	86	3.39
c	116	4.57
d	105	4.13
e	120	4.72
f	M20 x 1.5	
g	M20 x 1.5 / 1/2-14 NPT	
h	M16 x 1.5	

With integrated display and adjustment module the height of the housing increases by 18 mm / 0.71 inch.

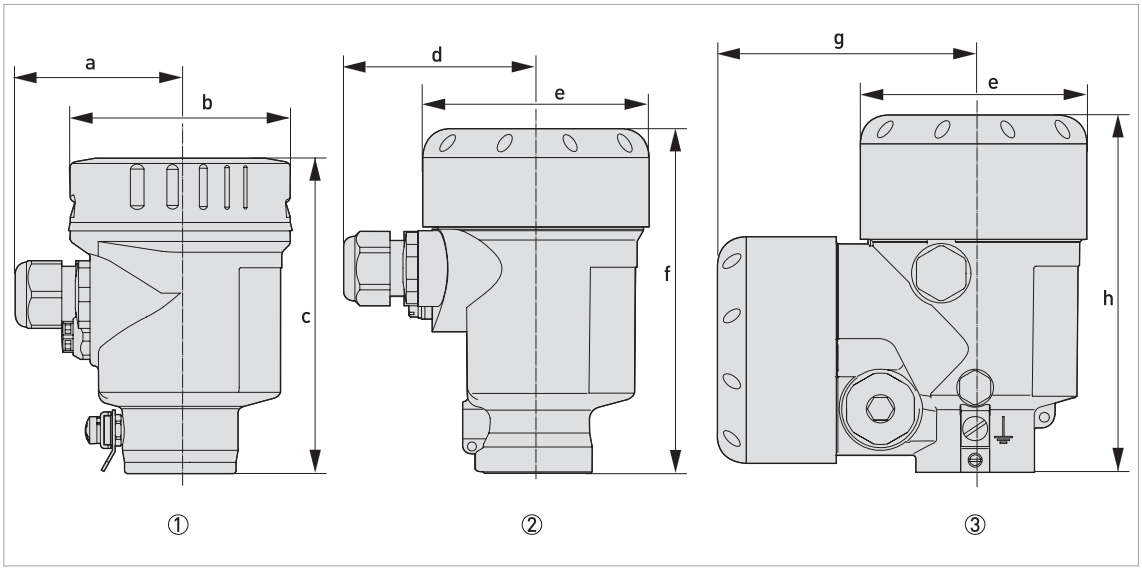


Figure 2-3: Stainless steel housing

① Single chamber, stainless steel (electro-polished)
② Single chamber, precision casting
③ Double chamber, precision casting

	Dimension [mm]	Dimension [inch]
a	59	2.32
b	80	3.15
c	112	4.41
d	69	2.72
e	79	3.11
f	117	4.61
g	87	3.42
h	120	4.72

With integrated display and adjustment module the height of the housing increases by 9 mm / 0.35 inch or 18 mm / 0.71 inch.

Housing version	Weight [kg]	Weight [lb]
Single chamber, stainless steel (electro-polished)	0.73	1.61
Single chamber, precision casting	1.31	2.89
Double chamber, precision casting	2.86	6.31

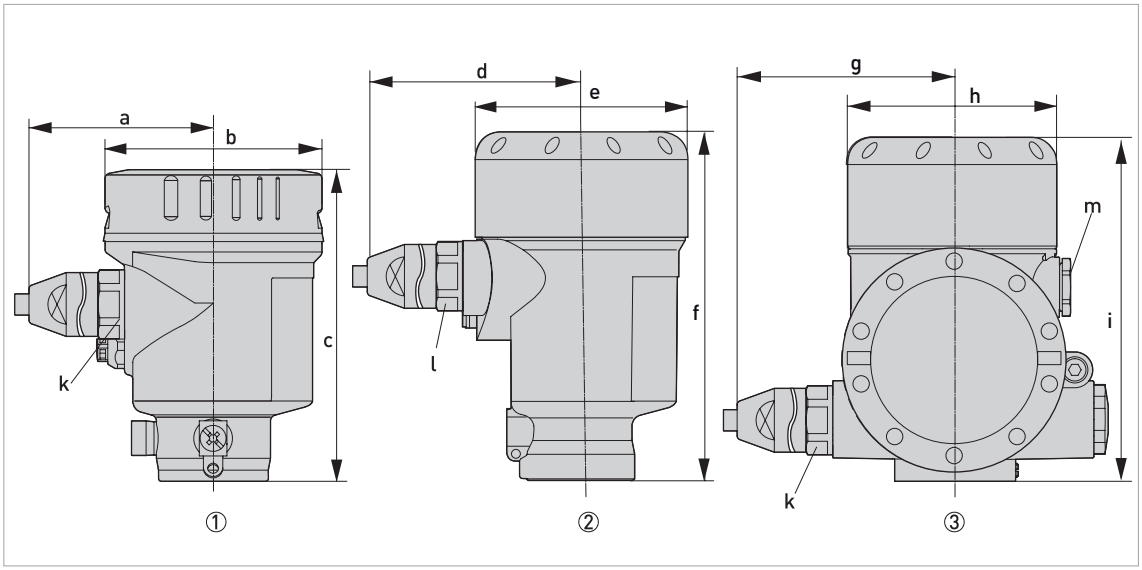


Figure 2-4: Stainless steel housing in IP66 / IP68 (1 bar) version

① Single chamber, stainless steel (electro-polished)
② Single chamber, precision casting
③ Double chamber, precision casting

	Dimension [mm]	Dimension [inch]
a	93	3.66
b	80	3.15
c	112	4.41
d	103	4.06
e	79	3.11
f	117	4.61
g	105	4.13
h	86	3.39
i	120	4.72
k	M20 x 1.5 / 1/2-14 NPT	
l	M20 x 1.5	
m	M16 x 1.5	

With integrated display and adjustment module the height of the housing increases by 9 mm / 0.35 inch or 18 mm / 0.71 inch.

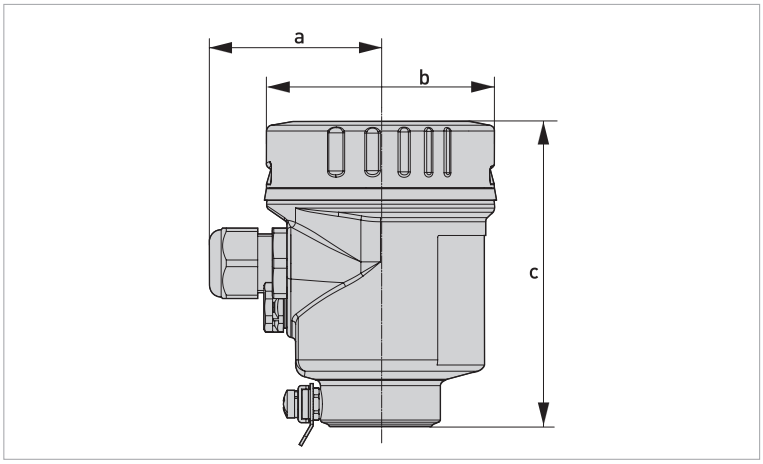


Figure 2-5: Stainless steel (electro-polished) IP69K version

	Dimension [mm]	Dimension [inch]
a	59	2.32
b	80	3.15
c	104	4.10

With integrated display and adjustment module the height of the housing increases by 9 mm / 0.35 inch.

Housing version	Weight [kg]	Weight [lb]
Single chamber, stainless steel (electro-polished)	0.73	1.61

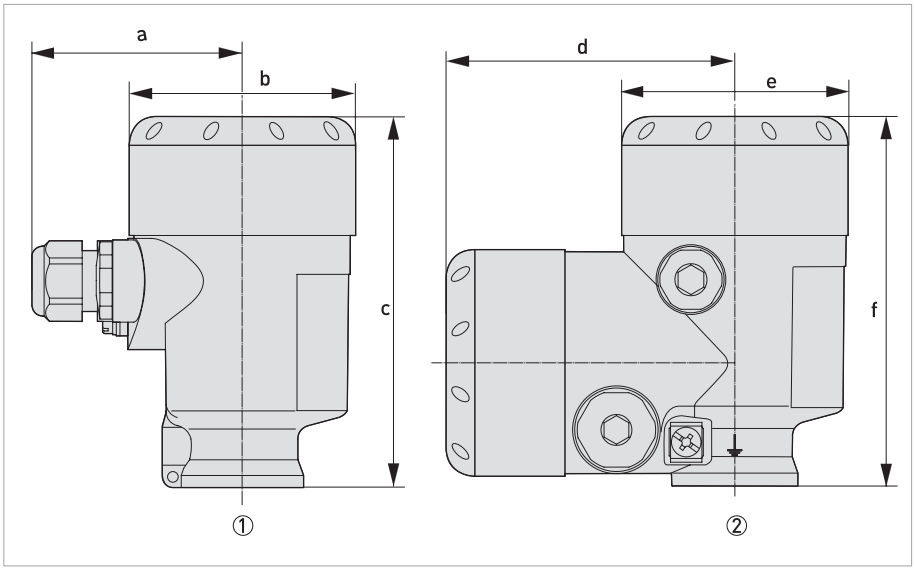


Figure 2-6: Plastic housing

① Single chamber
② Double chamber

	Dimension [mm]	Dimension [inch]
a	69	2.72
b	79	3.11
c	112	4.41
d	84	3.31
e	79	3.11
f	112	4.41

With integrated display and adjustment module the height of the housing increases by 9 mm / 0.35 inch.

Housing version	Weight [kg]	Weight [lb]
Single chamber, plastic	0.40	0.88
Double chamber, plastic	0.51	1.13

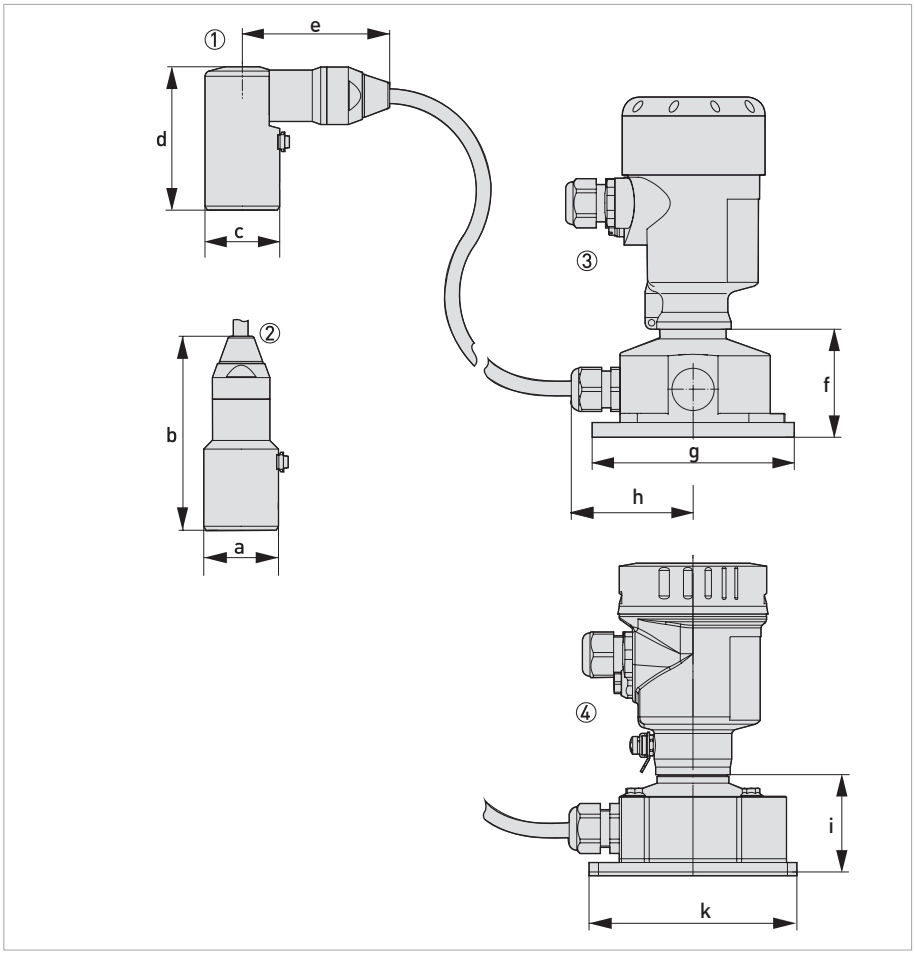


Figure 2-7: External housing

① Cable outlet, lateral
② Cable outlet, axial
③ Plastic single chamber housing (base in plastic)
④ Stainless steel single chamber housing (base in stainless steel)

	Dimension [mm]	Dimension [inch]
a	42	1.65
b	108	4.25
c	42	1.65
d	80	3.15
e	82	3.23
f	59	2.32
g	110 x 90	4.33 x 3.54
h	66	2.60
i	51	2.01
k	110 x 90	4.33 x 3.54

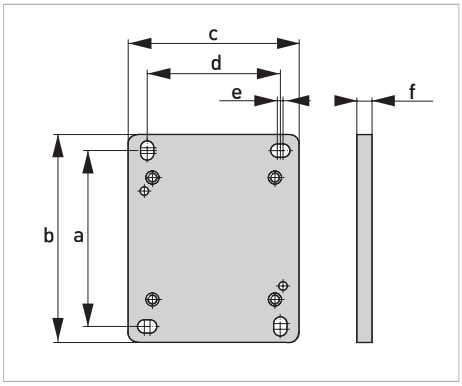


Figure 2-8: Mounting plate

	Dimension [mm]	Dimension [inch]
a	93	3.66
b	110	4.33
c	90	3.54
d	70	2.76
e	3	0.12
f	8	0.31

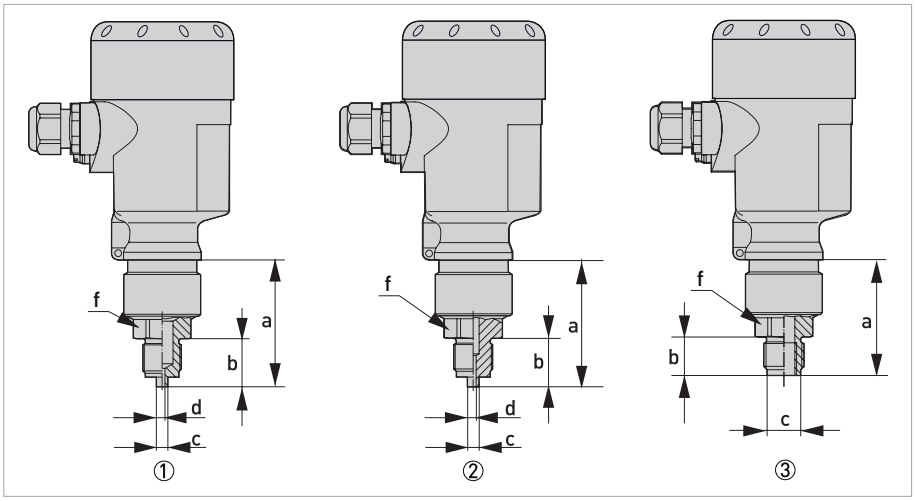


Figure 2-9: Thread recessed

① Thread ISO228 G1/2 EN 837-1
② Thread DIN13 M20 x 1.5 EN 837-1
③ Thread ISO228 G1/2 - G1/4 female DIN3852

Dimension [mm]	a	b	c	d	e	f
①	58	23	6	3	-	WS 27
②	58	23	6	3	-	WS 27
③	120	20	17.5	-	-	WS 27

Dimension [inch]	a	b	c	d	e	f
①	2.28	0.91	0.24	0.12	-	1.06
②	2.28	0.91	0.24	0.12	-	1.06
③	4.70	0.79	0.69	-	-	1.06

For the version with "secondary process barrier" the measure of length increases by 17 mm / 0.67".

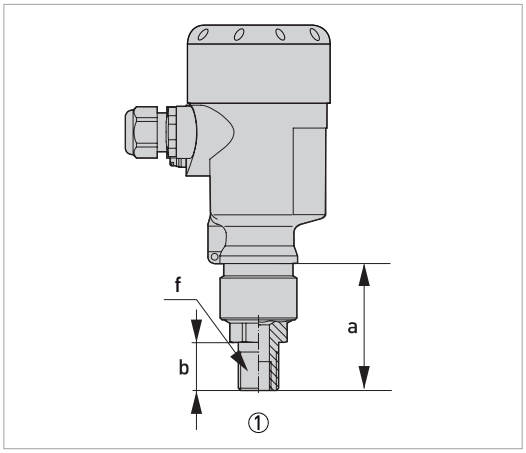


Figure 2-10: Thread recessed

① Thread ANSI 1/2 NPT - 1/4 NPT female

Dimension [mm]	a	b	c	d	e	f
①	54	19	-	-	-	WS 27

Dimension [inch]	a	b	c	d	e	f
①	2.13	0.75	-	-	-	1.06

For the version with "secondary process barrier" the measure of length increases by 17 mm / 0.67".

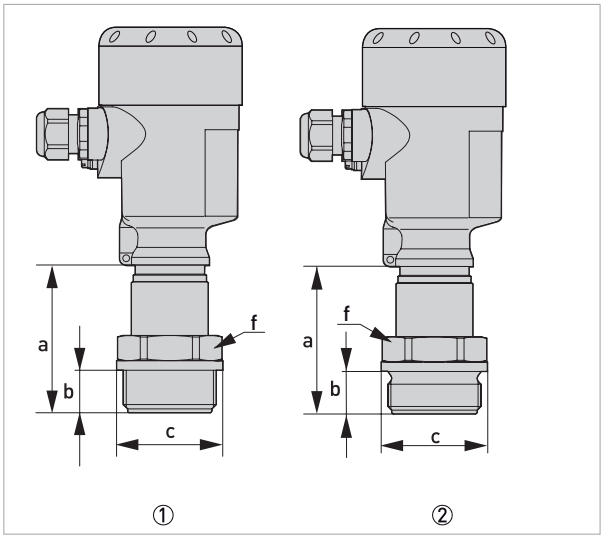


Figure 2-11: Thread front-flush

① Thread ANSI 1 1/2 NPT
② Thread ISO 228 G1 1/2, DIN 3852

Dimension [mm]	a	b	c	d	e	f
①	78	22	55	-	-	WS 46
②	79	22	55	-	-	WS 46

Dimension [inch]	a	b	c	d	e	f
①	3.07	0.87	2.17	-	-	1.81
②	3.11	0.87	2.17	-	-	1.81

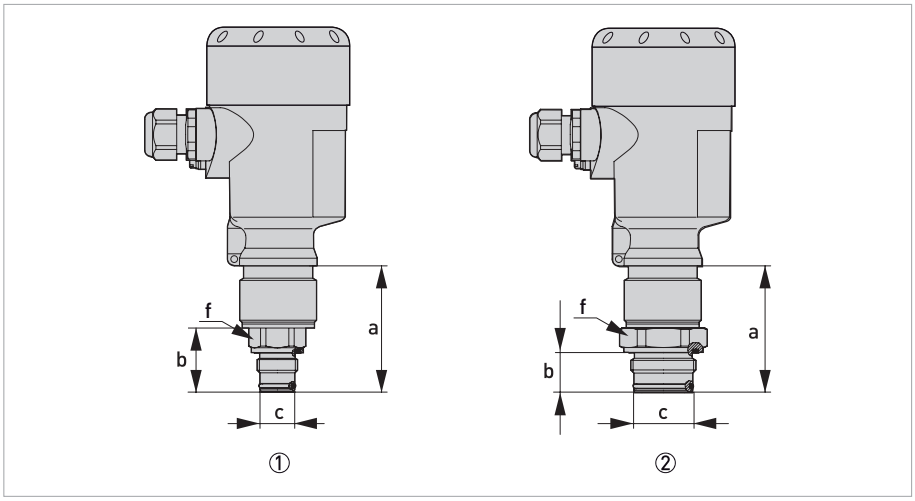


Figure 2-12: Thread front-flush

① Thread ISO 228 G1/2 with radial O-ring
② Thread ISO 228 G1 with radial O-ring

Dimension [mm]	a	b	c	d	e	f
①	58	20.5	18	-	-	WS 27
②	59	20.5	30	-	-	WS 41

Dimension [inch]	a	b	c	d	e	f
①	2.28	0.81	0.71	-	-	1.06
②	2.32	0.81	1.18	-	-	1.61

For the version with "secondary process barrier" the measure of length increases by 17 mm / 0.67".

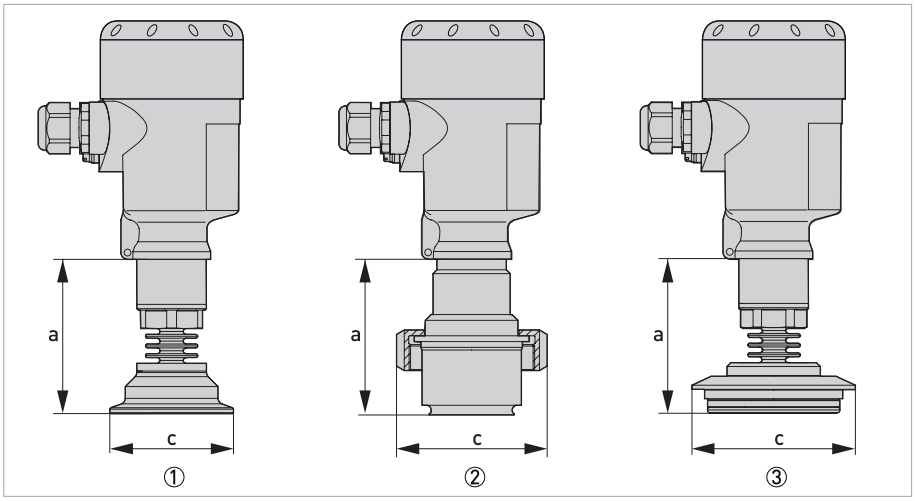


Figure 2-13: Hygienic connection 150°C / 302°F

① Clamp DN50 2" PN16, DIN 32676 / ISO 2852
② Hygienic fitting with compression nut F40 PN25
③ Varivent N50-40 PN25

Dimension [mm]	a	b	c	d	e	f
①	79	-	64	-	-	-
②	79	-	78	-	-	-
③	79	-	84	-	-	-

Dimension [inch]	a	b	c	d	e	f
①	3.11	-	2.52	-	-	-
②	3.11	-	3.07	-	-	-
③	3.11	-	3.31	-	-	-

For the version with "secondary process barrier" the measure of length increases by 17 mm / 0.67".

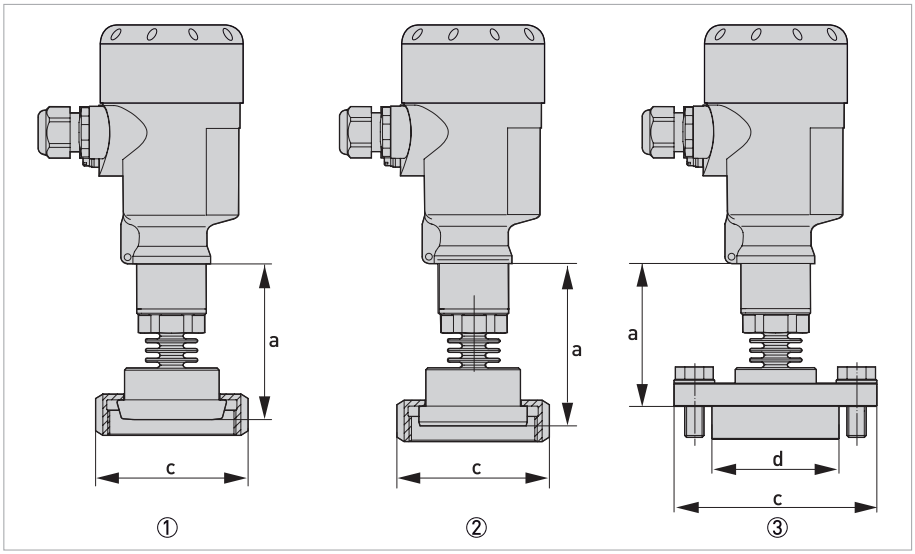


Figure 2-14: Hygienic connection 150°C / 302°F

① Collar connection DIN 11851, DN40 PN40
② Collar connection DIN 11864-1 Form A, DN50 PN 40
③ Flange DRD PN40

Dimension [mm]	a	b	c	d	e	f
①	79	-	78	-	-	-
②	82	-	92	-	-	-
③	79	-	105	65	-	-

Dimension [inch]	a	b	c	d	e	f
①	3.11	-	3.05	-	-	-
②	3.23	-	3.60	-	-	-
③	3.11	-	4.13	2.56	-	-

For the version with "secondary process barrier" the measure of length increases by 17 mm / 0.67".

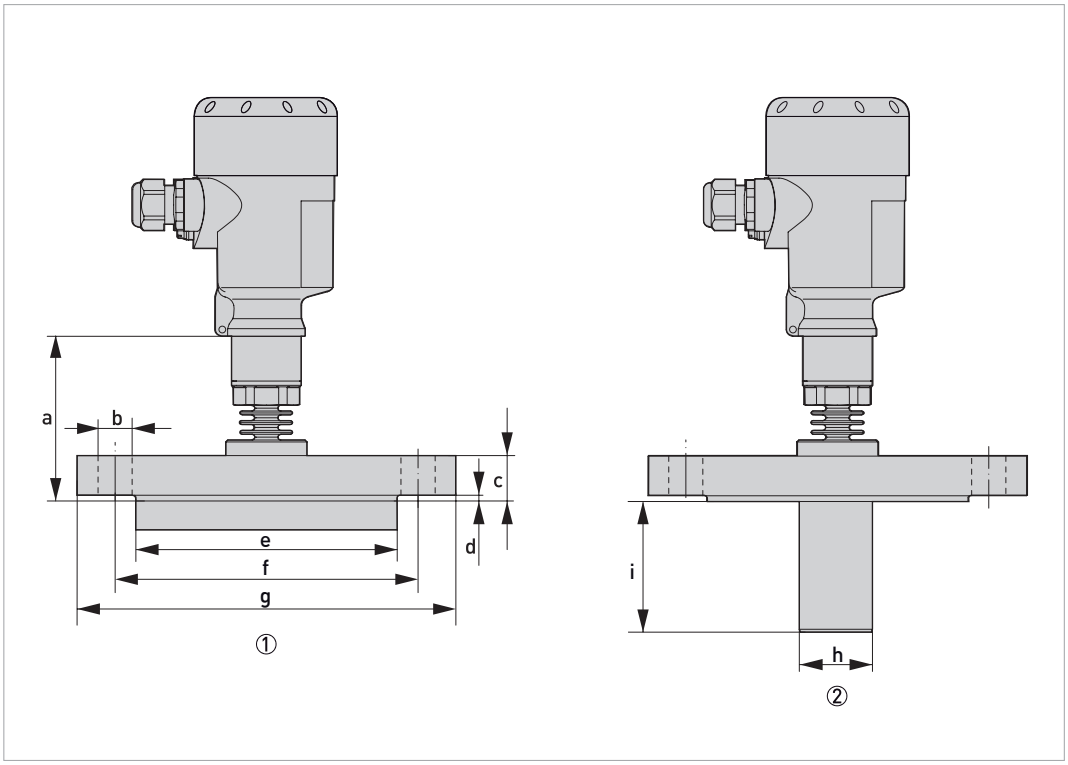


Figure 2-15: Dimensions - Flange

① Flange connection
② Flange connection with extension

Flange connection acc. to DIN 2501 or ASME B16.5

Dimension [mm]	a	b	c	d	e	f	g	h	i
DN40 PN40 Form C	80	4 x Ø 18	18	3	88	110	150	-	-
DN50 PN40 Form C	80	4 x Ø 18	20	3	102	125	165	-	-
DN50 PN40 Form C with extension	80	4 x Ø 18	20	3	102	125	165	40... 110	25...300
DN80 PN40 Form C	80	8 x Ø 18	24	3	138	160	200	-	-
2" Class 150 lb RF	80	4 x Ø 19.1	19.1	3.2	91.9	120.7	152.4	-	-
3" Class 150 lb RF	80	4 x Ø 19.1	23.9	3.2	127	152.4	190.5	-	-

Dimension [inch]	a	b	c	d	e	f	g	h	i
DN40 PN40 Form C	3.15	4 x Ø 0.71	0.71	0.12	3.46	4.33	5.91	-	-
DN50 PN40 Form C	3.15	4 x Ø 0.71	0.79	0.12	4.02	4.92	6.50	-	-
DN50 PN40 Form C with extension	3.15	4 x Ø 0.71	0.79	0.12	4.02	4.92	6.50	1.57... 4.33	0.98...11.81
DN80 PN40 Form C	3.15	8 x Ø 0.71	0.95	0.12	5.43	6.30	7.87	-	-
2" Class 150 lb RF	3.15	4 x Ø 0.75	0.75	0.13	3.62	4.75	6	-	-
3" Class 150 lb RF	3.15	4 x Ø 0.75	0.94	0.13	5	6	7.50	-	-

For the version with "secondary process barrier" the measure of length increases by 17 mm / 0.67".

2.3 Pressure ranges

Adjustment

Data refers to the nominal measuring range, pressure values smaller than -1 bar cannot be set

Adjustment range of min/max adjustment in relation to the nominal range:

- Percent value (-10...110%)
- Pressure value (-20...120%)

Adjustment range of the zero / span adjustment in relation to the nominal range

- Zero (-20...+95%)
- Span (-120...+120%)
- Difference between zero and span: max. 120% of the nominal range

Level (min./max. adjustment)

- Percent value -10...110%
- Pressure value -120...120%

Differential pressure ① (zero/span adjustment)

- Zero -95...+95%
- Span: -120...+120%

Density ① (min./max. adjustment)

- Percent value -10...110%
- Density value according to the measuring ranges in kg/dm^3

Interface ① (min./max. adjustment)

- Percent value -10...110%
- Height value according to the measuring ranges in m

① Only available for electronic differential pressure when the slave sensor is activated

Recommended maximum Turn Down (TD): 20:1 (no limit)

Nominal ranges and overload capacity in bar/kPa

This information is provided as an overview and refers to the measuring cell. Limitations due to the material and design of the process connection are possible. The information given on the nameplate applies.

2.3.1 Piezoresistive or strain gauge measuring cell

Nominal range	Maximum pressure	Minimum pressure
Gauge pressure		
0...+0.4 bar / 0...+40 kPa	+1.2 bar / +120 kPa	-1 bar / -100 kPa
0...+1 bar / 0...+100 kPa	+3 bar / +300 kPa	-1 bar / -100 kPa
0...+2.5 bar / 0...+250 kPa	+7.5 bar / +750 kPa	-1 bar / -100 kPa
0...+10 bar / 0...+1000 kPa	+30 bar / +3000 kPa	-1 bar / -100 kPa
0...+25 bar / 0...+2500 kPa	+75 bar / +7500 kPa	-1 bar / -100 kPa
0...+40 bar / 0...+4000 kPa	+120 bar / +12000 kPa	-1 bar / -100 kPa
0...+100 bar / 0...+10000 kPa	+200 bar / +20000 kPa	-1 bar / -100 kPa
0...+250 bar / 0...+25000 kPa	+500 bar / +50000 kPa	-1 bar / -100 kPa
0...+600 bar / 0...+60000 kPa	+1200 bar / +120000 kPa	-1 bar / -100 kPa
0...+1000 bar / 0...+100000 kPa	+1500 bar / +150000 kPa	-1 bar / -100 kPa
-1...0 bar / -100...0 kPa	+3 bar / +300 kPa	-1 bar / -100 kPa
-1...+1.5 bar / -100...+150 kPa	+7.5 bar / +7500 kPa	-1 bar / -100 kPa
-1...+5 bar / -100...+500 kPa	+15 bar / +1500 kPa	-1 bar / -100 kPa
-1...+10 bar / -100...+1000 kPa	+30 bar / +3000 kPa	-1 bar / -100 kPa
-1...+25 bar / -100...+2500 kPa	+75 bar / +7500 kPa	-1 bar / -100 kPa
-1...+40 bar / -100...+4000 kPa	+120 bar / +12000 kPa	-1 bar / -100 kPa
-0.2...+0.2 bar / -20...+20 kPa	+1.2 bar / +120 kPa	-1 bar / -100 kPa
-0.5...+0.5 bar / -50...+50 kPa	+3 bar / +300 kPa	-1 bar / -100 kPa

Nominal range	Maximum pressure	Minimum pressure
Absolute pressure		
0...+1 bar / 0...+100 kPa	+3 bar / +300 kPa	0 bar abs.
0...+2.5 bar / 0...+250 kPa	+7.5 bar / +750 kPa	0 bar abs.
0...+10 bar / 0...+1000 kPa	+30 bar / +3000 kPa	0 bar abs.
0...+25 bar / 0...+2500 kPa	+75 bar / +7500 kPa	0 bar abs.
0...+40 bar / 0...+4000 kPa	+120 bar / +12000 kPa	0 bar abs.

Nominal range	Maximum pressure	Minimum pressure
Gauge pressure		
0...+5 psi	+15 psi	-14.51 psi
0...+15 psi	+45 psi	-14.51 psi
0...+30 psi	+90 psi	-14.51 psi
0...+150 psi	+450 psi	-14.51 psi
0...+300 psi	+900 psi	-14.51 psi
0...+500 psi	+1500 psi	-14.51 psi
0...+1450 psi	+3000 psi	-14.51 psi
0...+3000 psi	+6000 psi	-14.51 psi
0...+9000 psi	+18000 psi	-14.51 psi
0...+15000 psi	+22500 psi	-14.51 psi

Nominal range	Maximum pressure	Minimum pressure
-14.5...0 psi	+45 psi	-14.51 psi
-14.5...+20 psi	+90 psi	-14.51 psi
-14.5...+150 psi	+450 psi	-14.51 psi
-14.5...+300 psi	+900 psi	-14.51 psi
-14.5...+600 psi	+1200 psi	-14.51 psi
-3...+3 psi	+15 psi	-14.51 psi
-7...+7 psi	+45 psi	-14.51 psi

Nominal range	Maximum pressure	Minimum pressure
Absolute pressure		
0...+15 psi	+45 psi	0 psi
0...+30 psi	+90 psi	0 psi
0...+150 psi	+450 psi	0 psi
0...+300 psi	+600 psi	0 psi
0...+500 psi	+1500 psi	0 psi

2.3.2 Metallic-ceramic measuring cell

Nominal range	Maximum pressure	Minimum pressure
Gauge pressure		
0...+0.1 bar / 0...+40 kPa	+15 bar / +1500 kPa	-1 bar / -100 kPa
0...+0.4 bar / 0...+40 kPa	+30 bar / +3000 kPa	-1 bar / -100 kPa
0...+1 bar / 0...+100 kPa	+35 bar / +3500 kPa	-1 bar / -100 kPa
0...+2.5 bar / 0...+250 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
0...+5 bar / 0...+500 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
0...+10 bar / 0...+1000 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
0...+25 bar / 0...+2500 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
-1...0 bar / -100...0 kPa	+35 bar / +3500 kPa	-1 bar / -100 kPa
-1...+1.5 bar / -100...+150 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
-1...+5 bar / 0...+500 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
-1...+10 bar / -100...+1000 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
-1...+25 bar / -100...+2500 kPa	+50 bar / +5000 kPa	-1 bar / -100 kPa
-0.05...+0.05 bar / -5...+5 kPa	+15 bar / +5000 kPa	-0.2 bar / -20 kPa
-0.2...+0.2 bar / -20...+20 kPa	+20 bar / +2000 kPa	-1 bar / -100 kPa
-0.5...+0.5 bar / -50...+50 kPa	+35 bar / +3500 kPa	-1 bar / -100 kPa

Nominal range	Maximum pressure	Minimum pressure
Absolute pressure		
0...+1 bar / 0...+100 kPa	+35 bar / +3500 kPa	0 bar abs.
0...+2.5 bar / 0...+250 kPa	+50 bar / +5000 kPa	0 bar abs.
0...+5.0bar / 0...+500 kPa	+50 bar / +5000 kPa	0 bar abs.
0...+10 bar / 0...+1000 kPa	+50 bar / +5000 kPa	0 bar abs.
0...+25 bar / 0...+25000 kPa	+50 bar / +5000 kPa	0 bar abs.

Nominal range	Maximum pressure)	Minimum pressure
Gauge pressure		
0...+1.5 psi	+220 psi	-14.51 psi
0...+5 psi	+435 psi	-11.60 psi
0...+15 psi	+510 psi	-14.51 psi
0...+30 psi	+725 psi	-14.51 psi
0...+150 psi	+725 psi	-14.51 psi
0...+300 psi	+725 psi	-14.51 psi
-14.5...0 psi	+510 psi	-14.51 psi
-14.5...+20 psi	+725 psi	-14.51 psi
-14.5...+150 psi	+725 psi	-14.51 psi
-14.5...+300 psi	+725 psi	-14.51 psi
-3...+3 psi	+290 psi	-14.51 psi
-7...+7 psi	+525 psi	-14.51 psi

Nominal range	Maximum pressure	Minimum pressure
Absolute pressure		
0...+15 psi	+525 psi	0 psi
0...+30 psi	+725 psi	0 psi
0...+150 psi	+725 psi	0 psi
0...+300 psi	+725 psi	0 psi

2.4 Ambient temperature effect on current output

Applies to the analogue 4...20 mA current output and refers to the set span
< 0.05% / 10 K, max. < 0.15%, each case at -40...+80°C / -40...+176°F

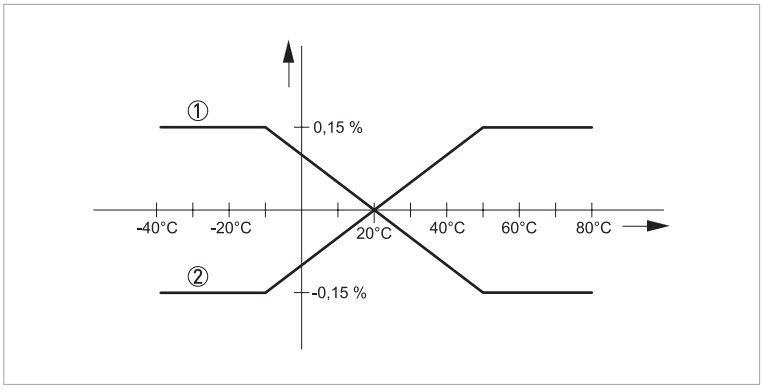


Figure 2-16: Ambient temperature effect on current output

① Falling characteristics
② Rising characteristics

2.5 Dynamic behaviour of the current output

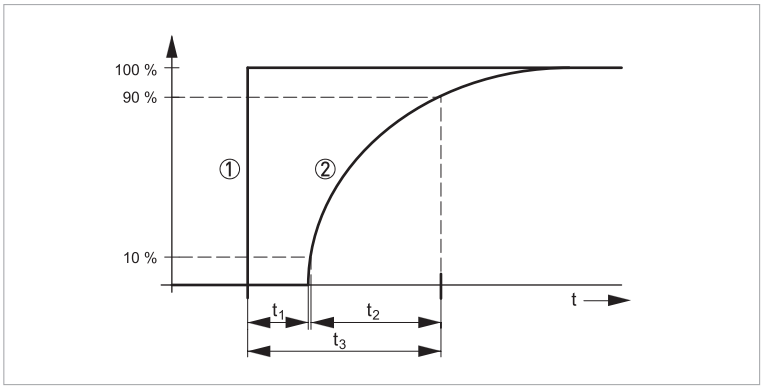


Figure 2-17: Behaviour at an abrupt change in the process variable.
t_1 - dead time; t_2 - rise time; t_3 - step response time

① Process variable
② Output signal

	Standard	IP68 (25bar)
Dead time (t1)	≤ 25 ms	≤ 50 ms
Rise time 10...90% (t2)	≤ 55 ms	≤ 150 ms
Step response time (t3)	≤ 80 ms	≤ 200 ms
Damping (63% of input variable)	0...999 seconds, adjustable in 0.1 second steps	

These parameters depend on the fill fluid, temperature and, if applicable, the diaphragm seal system.

3.1 Intended use

For devices used in hazardous areas, additional safety notes apply.

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The OPTIBAR PM 5060 C process pressure transmitter is suitable for measuring the process pressure and level of gases, vapours and liquids and applications with higher temperatures and high pressures. In combination with a slave sensor, the OPTIBAR PM 5060 C also provides the option of electronic differential pressure measurement of differential pressure, level, density and interface. The available measuring ranges and the respective permissible overloads are indicated on the nameplate. For details refer to *Technical data* on page 9. To observe the intended use, adhere to the following points:

- Observe the instructions in this document.
- Comply with the technical specifications (for further information refer to *Technical data* on page 9).
- Only suitably qualified personnel may install and operate the device.
- Observe the generally accepted standards of good practice.

3.2 Installation specifications

Observe the relevant directives, ordinances, standards and accident prevention regulations (e.g. VDE/VDI 3512, DIN 19210, VBG, Elex V, etc.).

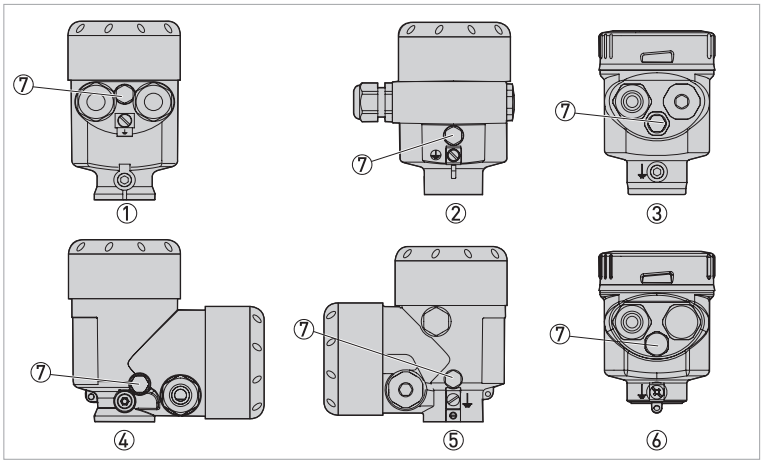
The accuracy of the measurement is only guaranteed if the transmitter and accompanying impulse line(s), if any, have been correctly installed. In addition, extreme ambient conditions including large fluctuations in temperature, vibrations and shocks should be kept as far away as possible from the measuring equipment.

3.3 Venting

The ventilation for the electronics housing is assured via a filter element in the vicinity of the cable glands, which is permeable to air but moisture-blocking.

In order to ensure effective ventilation, the filter element must be always free of deposits.

Do not use a high-pressure cleaner to clean the housing. The filter element may become damaged and as a result moisture can penetrate into the housing. The exception to this is the IP69K single chamber housing.



① Single chamber housing, plastic, stainless steel precision casting
② Single chamber housing, aluminium
③ Single chamber housing, stainless steel electro-polished
④ Double chamber housing, plastic
⑤ Double chamber housing, aluminium
⑥ Single chamber housing IP69k
⑦ Filter element

3.4 Measurement setup for measuring the process pressure

The following points should be observed in this application:

- The pressure transmitter must be mounted above the measuring point.

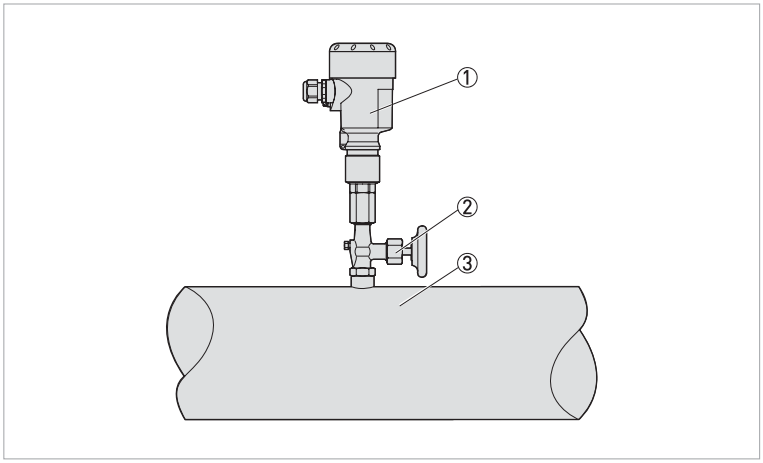


Figure 3-1: Measurement setup for measuring the process pressure of gases

① Pressure transmitter
② Shut-off valve
③ Tapping point

3.5 Measurement setup for measuring steam

The following points should be observed in this application:

- The pressure transmitter should be connected via a syphon to protect the measuring cell from non-permitted high temperatures.
- Siphon to be kept free of insulation.
- When using superheated steam, the siphon must be filled with water prior to start-up.

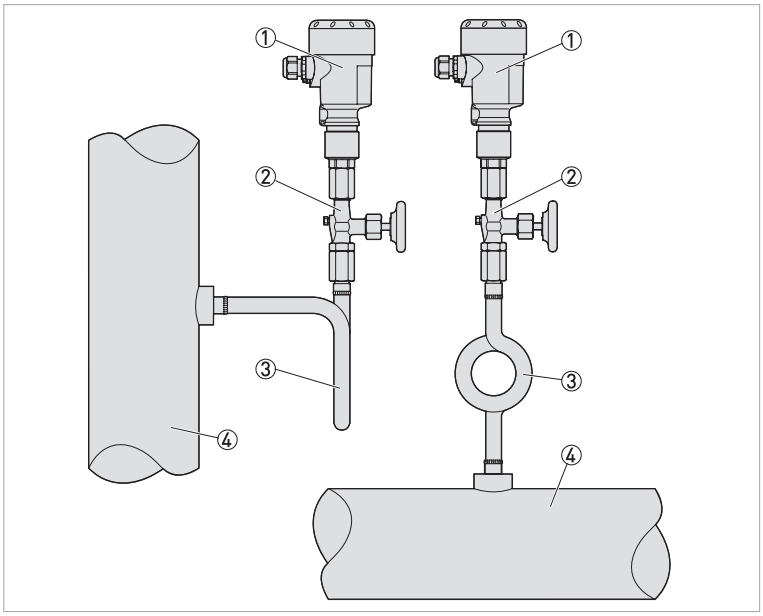


Figure 3-2: Measurement setup for measuring steam

① Pressure transmitter
② Shut-off valve
③ Syphon
④ Tapping point

3.6 Measurement setup for measuring fluids

The following points should be observed in this application:

- The pressure transmitter must be mounted below the measuring point.

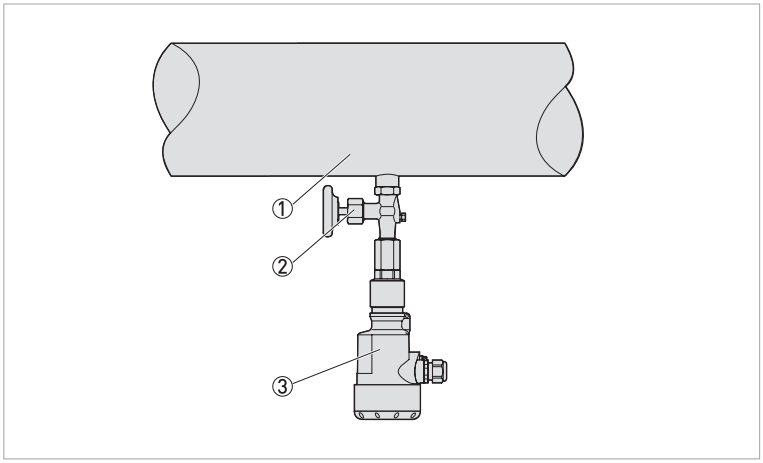


Figure 3-3: Measurement setup for measuring fluids

① Tapping point
② Shut-off valve
③ Pressure transmitter

3.7 Measurement setup for level measurement

The following points should be observed in this application:

- The pressure transmitter should be mounted below the lowest level.
- The pressure transmitter should be protected from filling/emptying current and agitator surges when mounted.

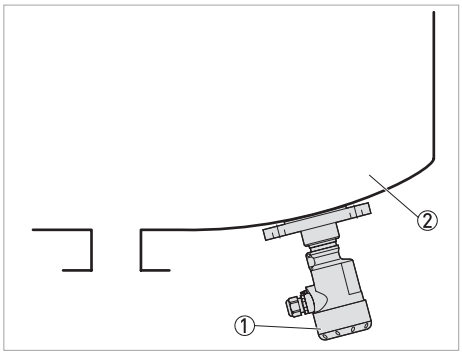


Figure 3-4: Measurement setup for level measurement

① Pressure transmitter
② Tank

3.8 External housing

A mounting plate is available as an option to facilitate the mounting of the external housing. For further information refer to *Technical data* on page 9.

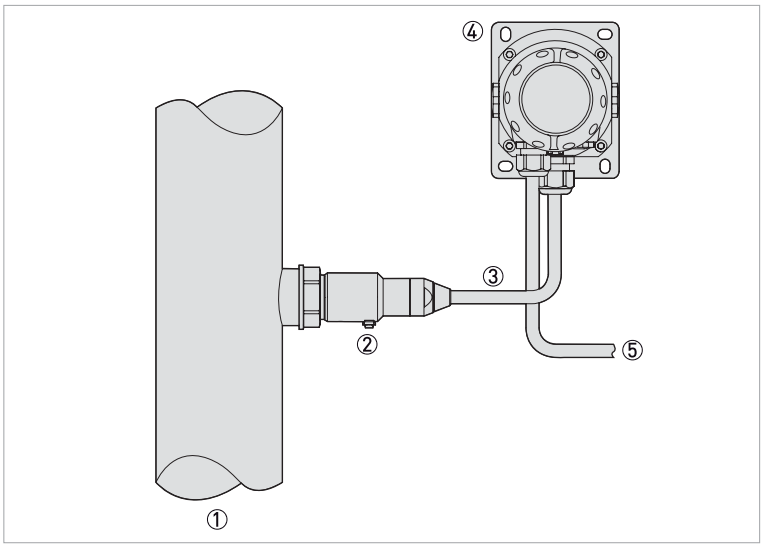


Figure 3-5: Measurement setup with an external housing

① Tapping point
② Sensor assembly
③ Connecting cable
④ External housing
⑤ Signal cable

IP68 version (25 bar)

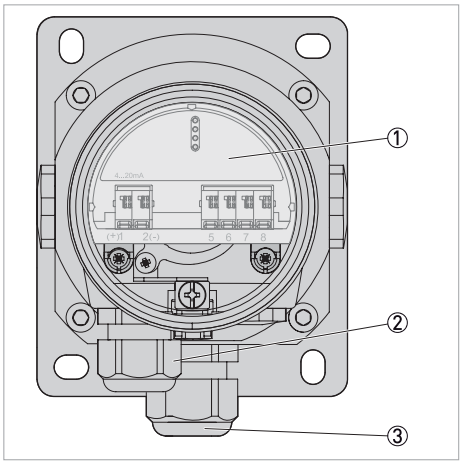


Figure 3-6: External housing (IP68)

① Electronic insert
② Cable gland for the power supply
③ Cable gland for the sensor connection cable

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

Observe without fail the local occupational health and safety regulations.
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Notes for electrical cables

The device must be grounded to a spot in accordance with regulations in order to protect personnel against electric shocks.

Cables may only be connected when the power is switched off! Since the transmitter has no switch-off elements, overcurrent protection devices, lightning protection and/or energy isolating devices need to be provided by the customer.

Metric thread M16 x 1.5 mm
The cable glands with metric threads are screwed in by the factory. They are sealed using plastic plugs to protect them during transport. Remove these plugs prior to establishing an electrical connection.

4.2.1 Requirements for signal cables supplied by the customer

If the signal cable was not ordered, it is to be provided by the customer. The following requirements regarding the electrical specifications of the signal cable must be observed:

Specifications for standard signal cables

- Test voltage: ≥ 500 VAC RMS (750 VDC)
- Temperature range: -40...+105°C / -40...+221°F
- Capacity: ≤ 200 pF/m / 61 pF/ft
- Inductance: ≤ 0.7 µH/m / 0.2 µH/ft
- Use cable with round cross section.
- We generally recommend the use of a shielded cable for HART® multidrop mode.

Make sure that the cable used features the required temperature resistance and fire safety for the maximum possible ambient temperature.

4.2.2 Laying electrical cables correctly

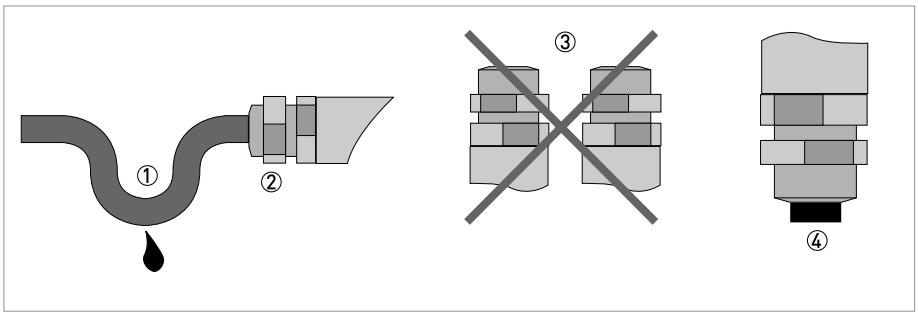


Figure 4-1: Protect housing from dust and water

① Lay the cable in a loop just before the housing.
② Tighten the screw connections of the cable entry.
③ Never mount the housing with the cable entries facing upwards.
④ Seal cable entries that are not needed with a plug.

4.2.3 Cable preparation

The device is connected with standard two-wire cable without shielding. If electromagnetic interference is expected which is above the test values of EN 61326-1 for industrial areas, a shielded cable should be used.

Check which outer diameter is suitable for the cable gland in order to ensure the sealing effect according to the specified IP protection class.

- 4.5...10 mm / 0.18...0.39" (standard)
- 4...11 mm / 0.16...0.43" (optional)

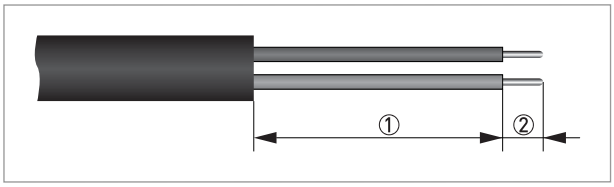


Figure 4-2: Stripping the cable

① 40...50 mm / 1.6...2"
② 5 mm / 0.2"

4.2.4 Cable entry 1/2-14 NPT (female)

With plastic housings, the NPT cable gland or the conduit steel tube must be screwed without grease into the thread.

4.2.5 Connector pin assignment

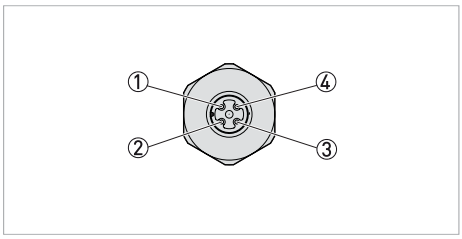


Figure 4-3: Connector M12 x 1, 4-pin, A-coding

① Shield
② Not used
③ VS-
④ VS+

Contact pin	Colour of cable	Electronic insert for terminal
Pin ①	Brown	1
Pin ④	Blue	2

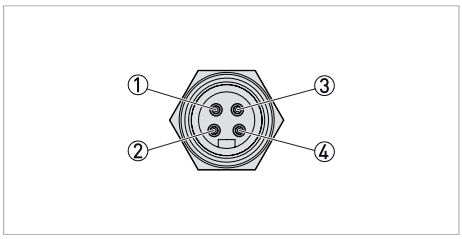


Figure 4-4: 7/8 connector, Foundation Fieldbus (FF)

① VS-
② VS+
③ Not connected
④ Cable shield

Contact pin	Colour of cable	Electronic insert for terminal
Pin ①	Blue	1
Pin ②	Brown	2
Pin ④	Green / yellow	Grounding

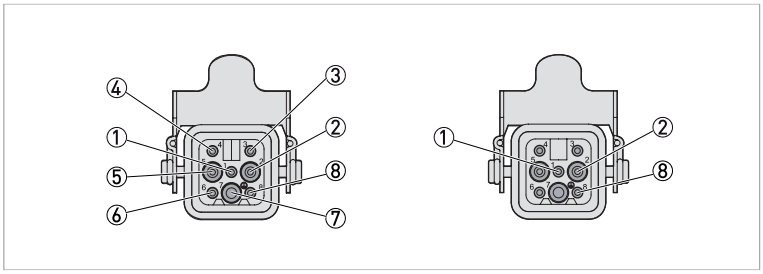


Figure 4-5: Connector, Harting HAN 8D (left) and Harting HAN 7D (right)

① VS-
② VS+

Contact pin	Colour of cable	Electronic insert for terminal
Pin ①	Black	1
Pin ②	Blue	2
Pin ⑧	Green / yellow	Grounding

4.2.6 Connection to the power supply

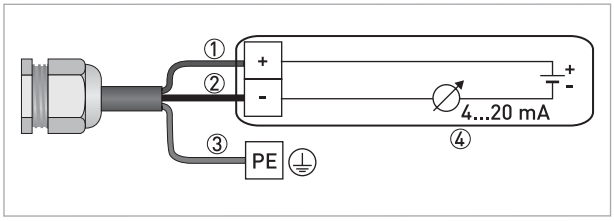


Figure 4-6: Connection to the feed unit

① Red
② Black
③ Green/yellow
④ Feed unit with load

4.2.7 Cable shield and grounding

If a shielded cable is necessary, connect the cable shield on both ends to the grounding potential.

In the device, the cable shield must be connected directly to the internal ground terminal.

The ground terminal outside on the housing must be connected to the grounding potential with low impedance.

In hazardous areas, the grounding is carried out according to the installation instructions.

Significant potential differences exist inside galvanization plants as well as on vessels with cathodic corrosion protection. A two-sided shield grounding can cause unacceptably high shield currents as a result.

The metallic and wetted parts (process connection, cap flange, measuring cell and separating diaphragm etc.) are conductive connected with the inner and outer ground terminal on the housing.

4.3 Electrical connection

The power supply and signal output are connected via screw terminals in the housing. The display and adjustment module is connected to the interface adapter via contact pins.

4.3.1 Connection in the terminal compartment

Procedure

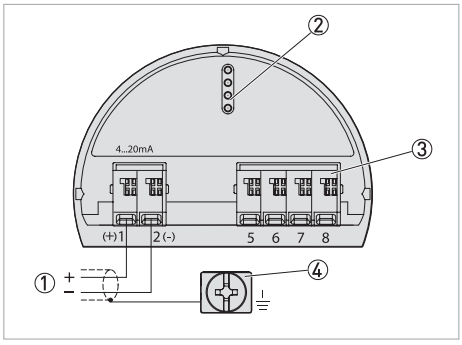
- Unscrew the housing cover.
- If present, remove the display and adjustment module by turning it to the left.
- Loosen union nut of the cable gland.
- For preparation of connection cable refer to *Cable preparation* on page 48.
- Push the cable through the cable gland into the terminal compartment.
- Insert the wire ends into the open terminal connection according to the wiring plan. Flexible cores with wire end sleeves as well as solid cores can be inserted directly into the terminal openings. In case of flexible cores, press the spring terminal with a small screwdriver to open the terminal opening.
- Check the proper hold of the wires in the terminals by lightly pulling on them.
- Connect the cable shield to the internal ground terminal, connect the outer ground terminal to the customer/plant equipotential bonding.
- Tighten the union nut of the cable gland. The sealing ring must completely enclose the cable.
- Screw the housing cover back on.

4.3.2 Single chamber housing

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

The following illustration applies to both the non-Ex as well as the the Ex ia, and the Ex d version.

Electronics compartment



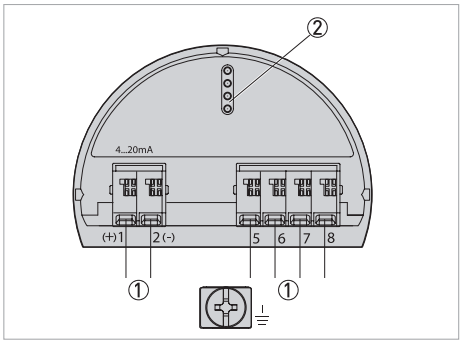
① Power supply / signal output
② Interface adapter for the display and adjustment module
③ Digital interface
④ Ground terminal for connection of the cable shield

4.3.3 Double chamber housing

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

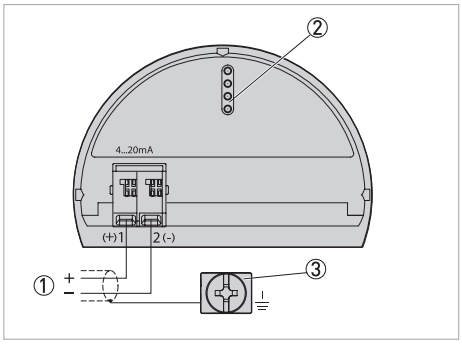
The following illustration applies to both the non-Ex as well as the Ex ia, and the Ex d version.

Electronics compartment



① Internal connection to terminal compartment
② Interface adapter for the display and adjustment module

Terminal compartment: Standard



① Power supply / signal output
② Interface adapter for the display and adjustment module
③ Ground terminal for connection of the cable shield

Terminal compartment: Additional current output

To make a second measured value available for use, you can use the supplementary electronics "Additional current output". Both current outputs are passive and need a power supply.

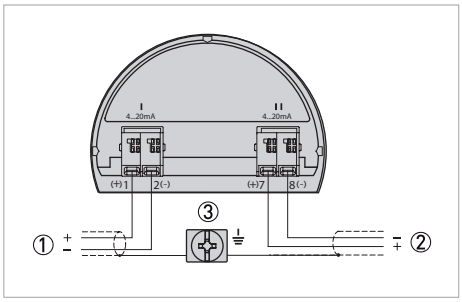


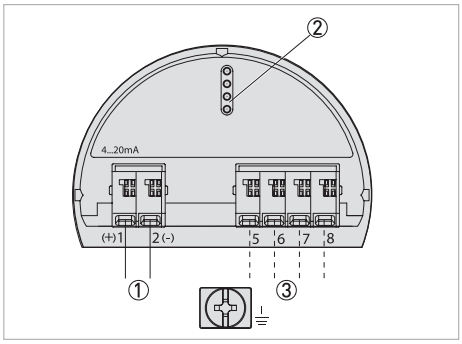
Figure 4-7: Additional current output

① First current output (I) - Voltage supply and signal output, sensor (HART®)
② Additional current output (II) - Voltage supply and signal output (without HART®)
③ Ground terminal for connection of the cable screening

4.3.4 Double chamber housing Ex d ia

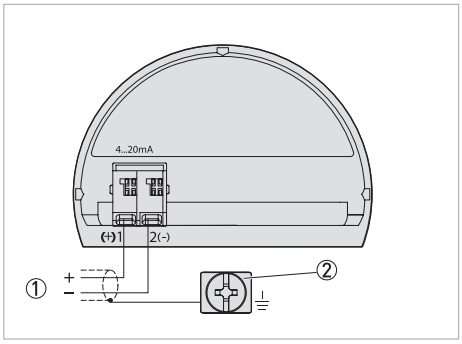
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

Electronics compartment



① Power supply / signal output
② Interface adapter for the display and adjustment module
③ Digital interface

Terminal compartment



① Power supply / signal output
② Ground terminal for connection of the cable shield

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