



**Hydrostatic Level and
Pressure Measurement**

NIVUS- Your Partner

In the fields of pressure measurement and hydrostatic level measurement technology NIVUS offers individual solutions for various applications.

Pressure transducers or detectors convert the mechanical magnitude „pressure“ to a directly proportional electric signal.

Pressure transmitters consist of a pressure transducer and specially tuned electronic compensating and amplifying components.

The compensation electronics are tuned to each transducer's individual requirements equalizing the electric signal's divergences due to the varying temperatures.

The amplification electronics convert the transducer's electrical signal to an output signal which is easy to handle in a metrological sense, such as 4...20 mA or 0...10 V.

Hydrostatic Level Measurement

The pressure existing at a certain depth within a liquid is direct proportional to the column of water above.

By calibrating a hydrostatic level probe to the respective liquid density, its output signal is tuned to the column of water to be measured.

Column of Water

Water is a thousand times as heavy as air. A water column with a base of 1 cm² and a height of 10 m weighs 1 kg. Immersing into water the pressure increases 1 bar per 10 m.

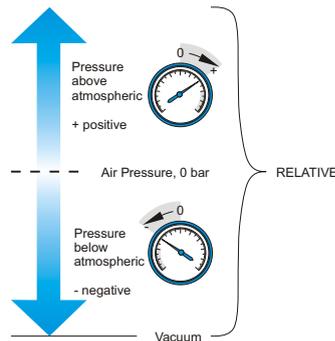
At a depth of 100 m the absolute pressure is 11 bar (1 bar air pressure on the water surface plus 10 bar water pressure). Relative to the surface the pressure is 10 bar.

10 mWS corresponds to approx. 1 bar.

Relative Pressure

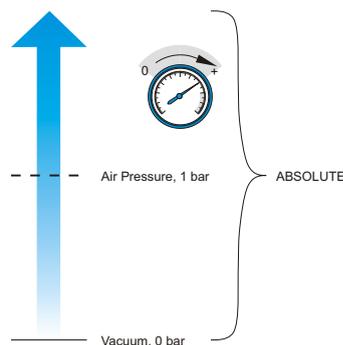
Normally pressure is measured relative to the air pressure. This means, the air pressure is 0 bar. Pressures higher than the air pressure result in positive values (pressure above atmospheric).

Pressures lower than the air pressure result in negative values (pressure below atmospheric).



Absolute Pressure

In rare cases it is however necessary to measure absolute pressures in a physical sense (such as in closed systems). In this case the transducers must be specially encapsulated.



Characteristics

The coherence between measured and output quantity is described by the characteristics. In the ideal case it is a straight line.

Characteristics Divergence Hysteresis

The hysteresis is the difference of the output quantity for a fixed measurement value for measurements with rising and dropping pressure.

Linearity Divergence

The linearity divergence is the highest divergence of the characteristics from the related straight line.

Temperature Error

The temperature error indicates the maximum divergence of the characteristics from the ideal course (for measurements at varying temperatures) within the compensated area. Normally, the temperature error is indicated for the complete compensated area, not per 10 K or 1 K.

Initial Value

The lowest unit value a measurement device is adjusted to, such as 4 mA.

Final Value / FS (Full Scale)

The highest unit value a measurement device is adjusted to, such as 20 mA.

Range / FSO (Full Scale Output)

The algebraic difference between initial value and final value, such as 16 mA at 4...20 mA.

Accuracy

How far the actual course may diverge from the ideal characteristics is indicated by the accuracy. The accuracy details are always refer to the measurement range as a percentage.

Example: nominal pressure: 50 bar
accuracy: 0.35 %
max. divergence: 0.175 bar

Reproducibility

The reproducibility defines the highest divergence of the output quantity for the measurement at recurred start.

Conversion Factors

1 mbar = 100 Pa
1 mbar = 14.5 PSI (lb / inch²)
1 PSI = 68.95 mbar
1 bar = 10.197 mWS
10 mWS at 4 ° C = 0.9807 bar
1 m = 3.28 ft

Characteristics Divergence according to IEC 770 Boundary Point Adjustment

This value defines the maximum total error in accordance with IEC 770, consisting of non-linearity, hysteresis and reproducibility according to the boundary point setting, this means the divergence from the straight line caused by initial and final value.

This definition on the one hand results in the highest characteristic divergence (up to factor 2) or BFSL (Best Fit Straight Line) in comparison with the initial value adjustment, however is best understood for the user metrologically .

For accuracy details in data sheets it must be said therefore how the error is defined.

A characteristics divergence of 0.5% FSO at boundary point adjustment corresponds approximately to a divergence of 0.25% BFSL.



Capacitive Ceramic Sensors

A pressure change causes a capacity change. Here the membrane is a part of the capacity.

Piezoresistive Silicone Sensors

A pressure change has the consequence of changing the resistance value of a measuring bridge on a silicon ceramic. It is distinguished between the non-encapsulated version, in which the medium directly affects the silicon ceramic, and transducers with high-grade steel membranes. Here, the measuring cell is fixed within a steel body which is closed by a thin high-grade steel membrane on the front side. The space between measuring cell and membrane is filled with silicone oil. Thus, the pressure can be transmitted from the diaphragm to the transducer without any disturbance.

Cable Probes

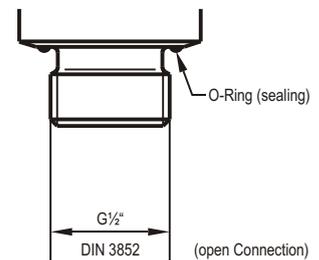
Cable probes are used in applications where the installation is made from above. Advantages of the hydrostatic level measurement are easy installation (such as by a straining clamp), an easy connection (mostly 2-wire-technology, 4-20 mA output) and surface foam will not cause any problems. The probes are robust built for universal use, and offer a high degree of operational safety.

Screw-In Probes

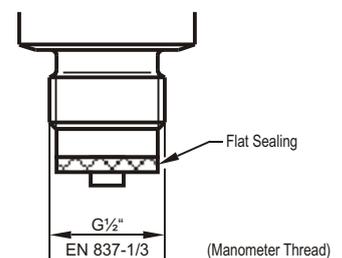
In many applications it is provided to use screw-in probes. If heavy sedimentation is expected, large front flush diaphragms are more suitable. Here normally probes with G1½" threads are in use.



In clear and slightly polluted liquids an open G1½" connection is suitable. Here the sealing is made by an O-ring.



Many old manometers are now replaced by modern pressure transmitters. The so-called 1/2" manometer connection is used here. Unlike the open connection this one has a front flush sealing area. Devices with this kind of connection are commonly used in the field of pneumatics or hydraulics, where only clear liquids or hydraulic oils are in use.



Hydrostatic Immersion Probes

Unit: relative
 Power supply: 12...36 V DC 2-wire
 Electric connection: diffusion-proof special cable with inner tube as reference, cable sheath made of PUR, optional PVC, FEP
 Mechanical connection: cable installation by straining clamp or pipe installation
 Special measuring ranges and custom-made models on request

AquaBar BS - Piezoresistive Si-High-Grade Steel Sensor (Well Probe)



Measurement ranges: 4, 6, 10, 20 mWS
 Max. measurement range: 160 mWS
 Accuracy: 0.35 % FSO
 Diameter: 19 mm (0.75 in)
 Enclosure: stainless steel 1.4571
 Diaphragm: stainless steel 1.4404
 Sealing: Viton®
 Applications: water and liquids wholesome with stainless steel

AquaBar - Piezoresistive Si-High-Grade Steel Sensor



Measurement ranges: 2, 4, 6, 10 mWS
 Max. measurement range: 160 mWS
 Accuracy: 0.35 % / 0.5 % FSO
 Diameter: 27 mm (1.06 in)
 Enclosure: stainless steel 1.4571
 Diaphragm: stainless steel 1.4404
 Sealing: Viton®
 Applications: water and liquids wholesome with stainless steel

NivuBar Plus - Capacitive Ceramic Sensor



Measurement ranges: 1, 2, 4, 6, 10 mWS
 Max. measurement range: 100 mWS
 Accuracy: 0.25 % / 0.35 % FSO
 Diameter: 39.5 mm (1.56 in)
 Enclosure: stainless steel 1.4571
 Diaphragm: Al₂O₃ 96%
 Sealing: Viton®
 Approval: II 1G EEx ia IIC/IIB T4
 Applications: water, wastewater and watery sludge

NivuBar H - Capacitive Ceramic Sensor



Measurement ranges: 0 - 20 mWS adjustable via HART to min. 20% FSO
 Accuracy: 0.1% FSO
 Diameter: 39.5 mm (1.56 in)
 Enclosure: stainless steel 1.4571
 Diaphragm: Al₂O₃ 96%
 Sealing: Viton®
 Approval (option): II 1GD EEx ia IIB/IIC T4 T85 °C
 Applications: water, wastewater and watery sludge

Screw-In Probes

Unit: relative
 Power Supply: 12...36 V DC 2-wire
 Output: 4-20 mA
 Option: on-the-spot display
 Special measuring ranges and custom-made models on request

NivuBar G - Capacitive Ceramic Sensor

Measurement ranges: 1, 2, 4 mWS
 Accuracy: 0.25 % / 0.35 % FSO
 Diameter: 39.5 mm (1.56 in)
 Enclosure: stainless steel 1.4571 with R1" external thread at cable end
 Diaphragm: Al₂O₃ 96%
 Sealing: Viton®
 Approval: II 1G EEx ia IIC/IIB T4
 Applications: water, wastewater, watery sludge and fuel oil
 Options: assembly pipe, assembly flange also completely welded



UniBar E - Piezoresistive Si-High-Grade Steel Sensor

Measurement ranges: 1, 2, 4, 6, 10, 20 bar or mWS
 Accuracy: 0.25 % / 0.35 % FSO
 Electric connection: solderless lugs or plugs according to DIN 4400
 Process connection: G½" DIN 3852 (open connection)
 Enclosure: stainless steel 1.4305
 Pressure connection: 1.4571
 Diaphragm: stainless steel 1.4404
 Sealing: Viton®
 Approval (option): II 1G EEx ia IIC T4
 Applications: pressure or level probe for clear liquids



Plug-On Display

Plug-On Display, suitable for UniBar with Plug
 Power supply: 4...20 mA current loop via probe
 Control output: 1 PNP-Control output free configurable
 Electric connection: plug according to DIN 4400
 Display: 4-character LCD
 Enclosure rating: IP65 (NEMA 4)
 Approval (option): II (1) 2G EEx ib IIC T4 (only in connection with 4-20 mA / 2-wire)



HydroBar G - Capacitive Ceramic Sensor

Measurement ranges: 1, 2, 4, 6, 10, 20 bar or mWS
 Accuracy: 0.25 % / 0.35 % FSO
 Electric connection: solderless lugs
 Process connection: G 1½" DIN 3852
 Enclosure: stainless steel 1.4305
 Pressure connection: 1.4571
 Diaphragm: Al₂O₃ 96%
 Sealing: Viton®
 Approval (option): II 1G EEx ia IIC/IIB T4
 Applications: level probe for liquids and sludge



Transmitters

NivuCont Plus VA-Enclosure



Multi-purpose Transmitter with 3-wire or intrinsically safe 2-wire Sensor Power Supply

- ⊙ one or two channel version
- ⊙ menu-driven operation with full graphic backlit LC display
- ⊙ wall and DIN rail mounting, IP65
- ⊙ approval (option) II (1) GD [Ex ia] IIC
- ⊙ isolated between input, output and power supply
- ⊙ max. 5 relays
- ⊙ volume calculation, pump control system
optional: basin purification control
- ⊙ RS232

19"-Version NivuCont Plus



Multi-purpose Transmitter with 3-wire or intrinsically safe 2-wire Sensor Power Supply

- ⊙ one or two channel version
- ⊙ menu-driven operation with full graphic backlit LC display
- ⊙ rack or panel mounting, IP20
- ⊙ approval (option) II (1) GD [Ex ia] IIC
- ⊙ isolated between input, output and power supply
- ⊙ max. 5 relays
- ⊙ volume calculation, pump control system
optional: basin purification control
- ⊙ RS232

NivuCont S



Powerful Transmitter for a 2- and 3-wire Sensors

- ⊙ DIN rail or panel mounting, IP40; clamps IP20
- ⊙ power supply 230 V AC or 24 V DC
- ⊙ display: 4-character LED
- ⊙ 2 relays, 1 error message relay
- ⊙ mA output isolated
- ⊙ approval (option) II (1) GD [Ex ia] IIC

Accessories - hydrostatic Level and Pressure Probes



AKL-1 Straining Clamp for High-Grade Steel Immersion Probes

Clamping Connection Box for hydrostatic probes with integrated pressure compensation
optional: integrated lightning protection

DataPro 2x1 24Vx24V Lightning Protection for 2-wire probes



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