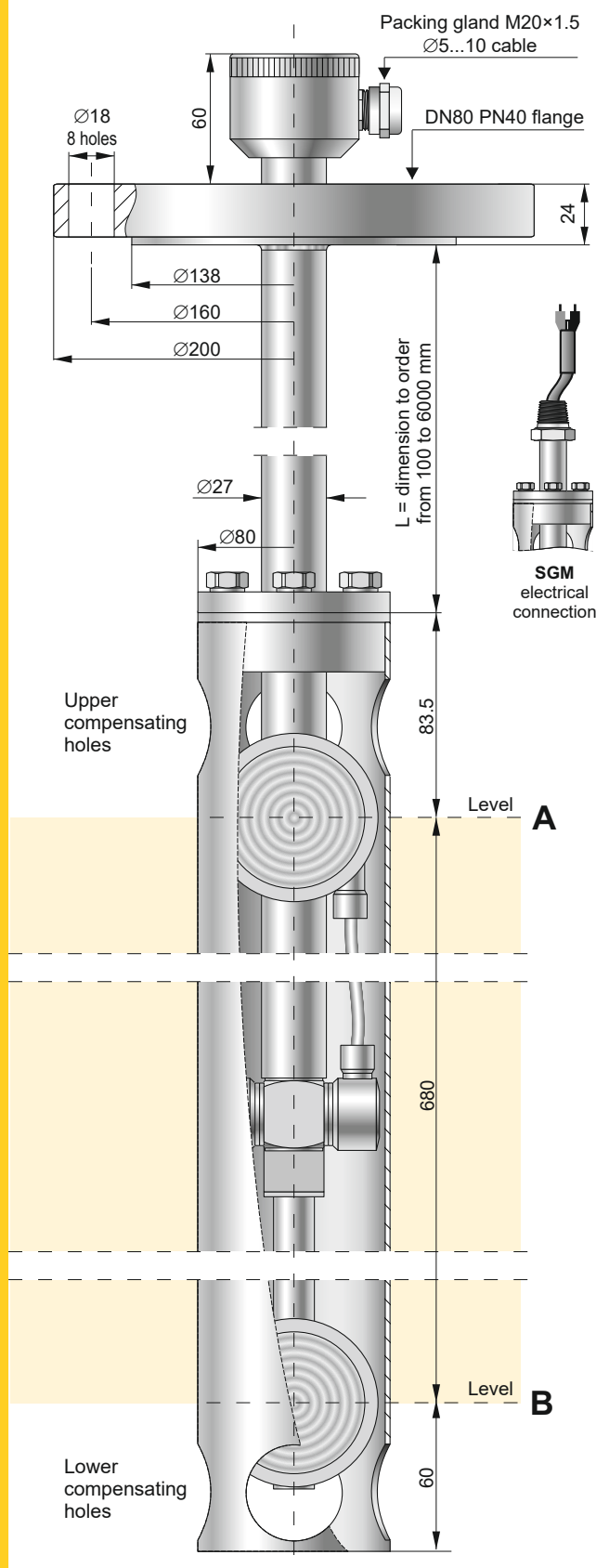


Smart hydrostatic density transmitter PG-28.Smart

HART
COMMUNICATION PROTOCOL



- ✓ Density measuring range 0...1 g/cm³ or 0...2 g/cm³
- ✓ Accuracy 0,1%
- ✓ Output signal 4...20 mA + HART
- ✓ Static pressure limit 40 bar

Construction and operation

The hydrostatic density transmitter PG-28.Smart has been developed on the base of the smart differential pressure transmitter with two remote diaphragm seals. Fixed remote diaphragm seals along with the differential pressure transmitter have been mounted in a protecting tube, 80 mm in diameter. The assembly should operate in a vertical position, and the medium surface should be above the upper compensating holes of the tube.

The input signal for the density transmitter is the hydrostatic pressure generated by the medium layer between the levels assigned by the axes of diaphragm seals. In the picture those levels are marked with the letters A and B. Considering the constant thickness of the "A-B" layer, it can be assumed that the input signal for the density transmitter is the average density of the "A-B" layer.

The welded flange DN80 PN40 is provided to mount the density transmitter on a pressure tank. The location of the device working part at appropriate depth is possible with the Ø27 tube having the length "L", depending on a purchaser's order.

The density transmitter can be mounted on an atmospheric pressure tank with any fastener for the Ø27 tube, but the vertical position of assembly must be kept.

The typical application for the transmitter is to measure the density of the following media: petroleum products, liquid fuels, including LPG and other liquids, which are non-corrosive against 316 Lss acid resistant steel.

The electrical clamp box, degree of protection IP 65, adapted to weather conditions, is provided to connect the density transmitter.

An important advantage of the density transmitter design is the application of welded diaphragm seals as well as measuring element, which guarantees that the assembly stays hermetic for a long-time.

Configuration and calibration (example)

Measurement task: transform the change of density from 400 kg/m³ to 600 kg/m³ into the change of input current in the range from 4 mA to 20 mA.

Procedure:

Calibration with reference to water density at 20°C (998,20 kg/m³) and determination of transmitter characteristic

Pour distilled water having the temperature of 20°C to the vessel at least 85 cm in height. Immerse transmitter, connected to a power source, in water, remembering the vertical operating position. When the temperature equilibrium is reached (after about 20 min), accomplish the pressure zeroing of the probe ("Zero Trim" in Calibration menu).

Then, pull the density transmitter out of water and position it vertically. It is assumed that the probe is surrounded by the medium having density 1.16 kg/m³ (air density in normal conditions). After pressing the PV key, choose the command "current pressure reading" and record the measured value, e.g. $P_{air} = -6.649$ kPa. In this way, the two-point density transmitter characteristic has been performed.

For water: $P_{water} = 0,000$ kPa, $\rho_{water} = 998,20$ kg/m³
For air: $P_{air} = -6,649$ kPa, $\rho_{air} = 1,16$ kg/m³

Determination of the pressure corresponding to the start point of the measuring range, $\rho_{min} = 400$ kg/m³:

$$\frac{P_{water} - P_{air}}{\rho_{water} - \rho_{air}} \times (\rho_{min} - \rho_{water}) = \frac{6.649}{997.04} \times (-598.2) = -3.989 \text{ kPa}$$

Determination of the pressure corresponding to the end point of the measuring range, $\rho_{max} = 600$ kg/m³

$$\frac{P_{water} - P_{air}}{\rho_{water} - \rho_{air}} \times (\rho_{max} - \rho_{water}) = \frac{6.649}{997.04} \times (-398.2) = -2.655 \text{ kPa}$$

The calculated values for hydrostatic pressure corresponding to both start and end points of the density measuring range are sent to the transmitter (Configuration → Reranging → Upper and Lower Range value → Keyboard).

After the above parameters have been entered, the transmitter carries out the measuring task.

Manufacturing calibration, operation guidelines

The user can order the density transmitter with manufacturing calibration in a required density range, specified in the order. Such a transmitter carries out assumed measurement just after electrical connection and installation at operation place.

Pressure zeroing of the transmitter in distilled water at 20°C is recommended after every 24 months of the transmitter operation.

Measuring range

No	Nominal measuring range (FSO)	Nominal range with reference to measured density	Minimum set range	Ability to shift the start of the range
1	-70...0 mbar	0...1000 kg/m³	100 kg/m³	0...900 kg/m³
2	-70...70 mbar	0...2000 kg/m³	200 kg/m³	0...1800 kg/m³

Technical data

Metrological parameters

Accuracy	≤ ±0,1% of the calibrated range ≤ ±0,3% for the range 0...10% FSO
Long term stability	≤ accuracy for 2 years
Thermal error	< ±0,1% (FSO) / 10°C max. ±0,4% (FSO) in the whole compensation range < ±2% of minimal measuring range in the whole compensation range
Thermal compensation range	-30...60°C
Time constant	1 s
Additional electronic damping	0...30 s
Error due to supply voltage changes	0,002% (FSO) / V

Electrical parameters

Power supply	10,5...36 VDC
Output signal	4...20 mA, two wire transmission
Load resistance	$R[\Omega] \leq \frac{U_{sup}[V] - 10,5V}{0,0225A}$
Resistance required for communication	min. 240 Ω

Operating conditions

Medium temperature range	-40...80°C
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Note: The medium must not be allowed to freeze in the immediate vicinity of the transmitter

Material of casing and supporting structure	0H18N9 (SS304)
Material of diaphragm seals	00H17N14M2 (SS316L)

Ordering procedure

PG-28.Smart / / / L = ... mm

Nominal measuring range

Set density range

Ø27 Tube length