Process Insights™
Premium Insights Into Process

PORTABLE DEW POINT METERS

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PRODUCT DATASHEET

Model XPDM™

Portable dew point meter for fast and precise spot checks of moisture

Fast

Accurate

Low Maintenance

- Spot checking
- Harmonizing and verifying
- Electrical insulating gases
- SF6 moisture measurement
- Natural gas pipelines
- Cryogenic gas producers
- Specialty gas producers
- Welding and joining gas measurement

Overview

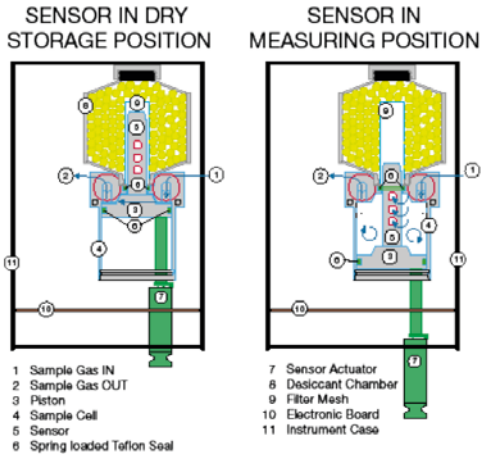
The portable dew point meter Model XPDM is a battery operated, hand-held instrument, designed for applications where quick and accurate dew point measurements have to be made. With the XPDM, accurate spot-checks of moisture in gases can be made faster and easier than ever, over the range of -148°F to +68°F (-100°C to +20°C) dew point.

Applications

Important uses of the XPDM include: petrochemical, feedstock gases, instrument air, transformer and switch gear insulating gases, gas cylinders and air separation plants, welding gases, shipboard LNG and aviation oxygen, transfer standard, custody transfer and others.

Operating Principle

Aluminum oxide sensors adsorb much faster than they desorb water molecules. It is therefore an advantage, if at the beginning of the measurement the sensor is dryer than the sample to be measured. The XPDM keeps the sensor in dry storage until the measurement is taken. The sensor slides directly from the dry storage into the sample cell, without ever coming in contact with ambient air. After the measurement is completed, the sensor slides back into the dry storage, where it is dried down for the next sample.



Dry Storage System

The sensor is separated from the desiccant by a very fine stainless steel mesh with a thickness of approximately 5 mil. Close proximity of the sensor to the desiccant is crucial for fast dry down. With the sensor in the dry storage position, the sample flows through the head space between the bottom of the sample cell and the sensor piston. In order to take a measurement, the gas outlet is blocked temporarily. The pressure of the sample flow pushes the piston and pulls the sensor into the sample cell, where it wets up quickly to the moisture content in the sample flow. An accurate reading can be taken within 1 to 2 minutes. Afterwards, the sensor is pushed back into the dry storage position by means of the sensor actuator which protrudes through the front of the instrument.

Sample Cell Design

All surfaces in contact with the sample are made from 316 stainless steel and are electropolished to assure rapid equilibrium with the sample. Sensor and piston slide through spring-loaded PTFE seals protecting the sample cell as well as the desiccant cartridge from intrusion of wet air or gas. The sample cell can measure gas flows of up to 20 liters per minute. The flow rate has no effect on the measurement. The pressure in the sample cell is near atmospheric and should not exceed 2 bar (29 psi). The instrument computer gives a read out at sensor pressure as well as at any line pressure the user enters for the particular sample. No correction is needed for different gases.

Sample Connections

Sample connections can be made by means of a variety of different fittings, depending on the application. The primary port fittings are 1/4" VCO. The following table shows the recommended fittings for different dewpoint ranges and instrument uses:

Type of Adapter	Range	Remarks
VCO to barbed hose	Used above -85°F (-65°C)	Make sure sample flow rate is sufficient. Use PTFE hoses only
VCO to VCO	All ranges	Where flexible connection is required, use flexible stainless steel hoses
VCO to Swagelok	All ranges	Where rigid connections are acceptable

Span Check Without Reference Standards

The Hyper-Thin-Film (HTF) Al_2O_3™ Moisture Sensor Technology high capacitance sensors have a very low residual capacitance when dry, and saturate at a pre-designed level of humidity above +68°F (+20°C). This allows a span check of the sensor by cupping the sensor in the palm of one's hand for one minute, and adjusting the instrument to its upper range limit. The advantages of this span check system are obvious: sensors can be field calibrated anywhere, anytime without using expensive and cumbersome calibration standards. Sensors do not have to be returned to the factory for recalibration, which also eliminates the need for a second stand-by sensor.

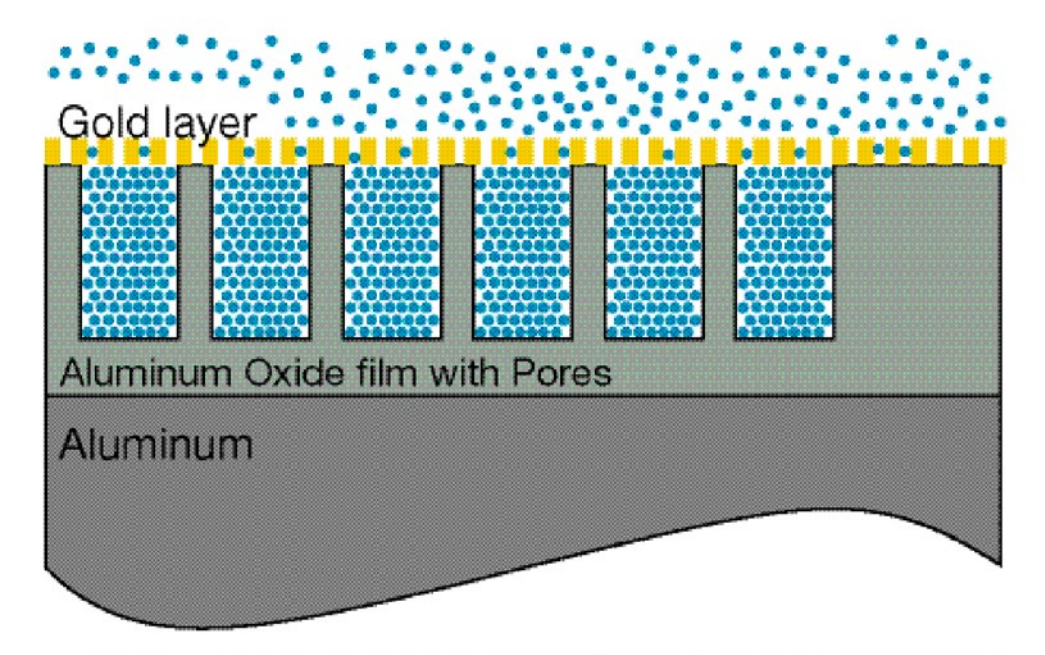
Hyper-Thin-Film (HTF) Al_2O_3 Moisture Sensor Technology

The HTF™ aluminum oxide sensor installed in the model XPDM is the product of years of intensive research at the laboratories. It offers significant performance advantages over all other aluminum oxide moisture sensors.

The operating principle is similar to that of other aluminum oxide sensors: a hygroscopic layer of aluminum oxide adsorbs or releases water molecules within its pores, depending on the water vapor pressure in its environment. Thus, the electrical capacitance of the aluminum oxide layer changes with the surrounding water vapor pressure. The electrical capacitance is measured between the aluminum core of the sensor and a porous conductive gold layer on the outside.

The advantage of the sensor is a proprietary manufacturing method in which the aluminum oxide layer is made to be hyper-thin as well as extremely hygroscopic. This results in a very sensitive sensor with fast response.

HTF™ TECHNOLOGY

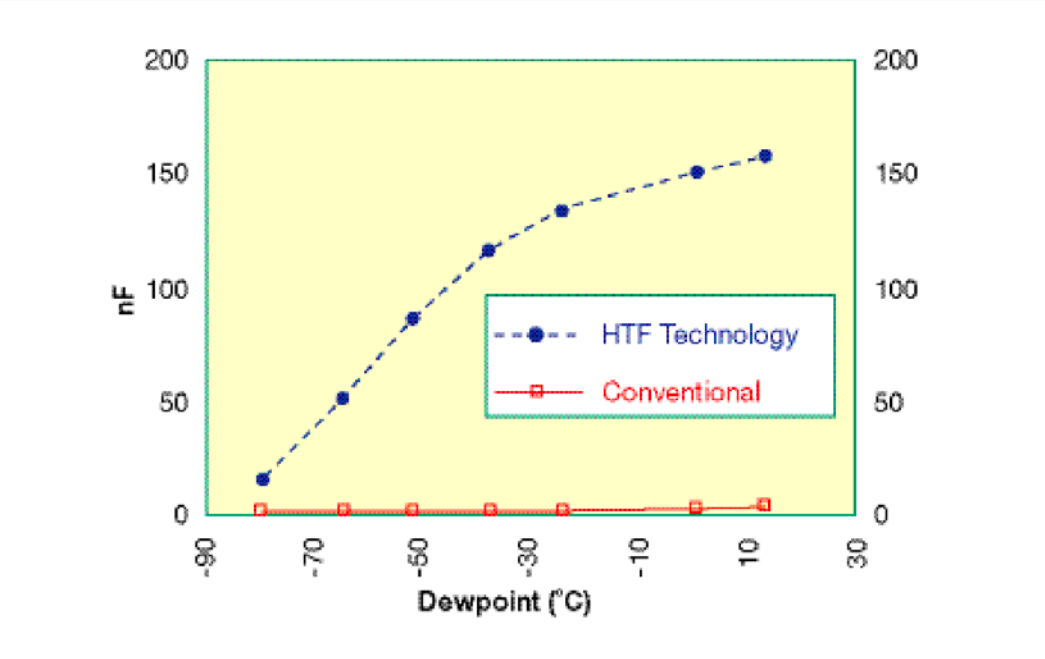


Operating Principle of Al_2O_3 Sensor

High Capacitance Response

Due to the HTF Hyper-Thin-Film and a special pore geometry, sensors have a capacitance change over their full range, several orders of magnitude larger than that of conventional aluminum oxide sensors. Additionally, this change is quasi-linear and its sensitivity to temperature is negligible.

The advantages of a linear high capacitance response are: better sensitivity, better repeatability and faster response times. Also, the measurement system is less prone to noise and drift, and signal conditioning is kept to a minimum.



Hyper Thin Film vs. Conventional Al_2O_3 Sensor. Change of Capacitance with Dew Point

TECHNICAL SPECIFICATIONS

Dew Point Sensor Element:	
Type	Hyper Thin Film high capacitance Al_2O_3
Dewpoint range	-148°F to +68°F (-100°C to +20°C)
Accuracy	±5.5°F (± 3°C)
Repeatability	±0.9°F (±0.5°C)
Response time	For a step change from -40°C to -60°C: 63% in 90 seconds; 90% in 450 seconds
Temperature Range:	
Sensor	-22°F to 120°F (-30°C to +50°C)
Electronics	14°F to 120°F (-10°C to +50°C)
Storage temperature	-4°F to +140°F (-20°C to +60°C)
Sample flow range	Static to 100 m/s (linear velocity @1atm)
Calibration method	This field calibration procedure is fully automated and the user is prompted though a simple one minute procedure, which requires no additional equipment. NIST traceable factory calibration optionally available.
Temperature Range:	
The sample temperature is measured with a precision integrated circuit temperature sensor. Units may be optionally fitted with a pressure sensor.	
Mechanical:	
Enclosure	Anodized Aluminum, Dimensions: 2.5" x 4.25" x 7.5" Regulator and filter mounting facilities.
Sampling chamber	Electro-polished 316 stainless steel
Moving parts seals	Spring energized PTFE seals
Pressure operating range	Standard: 29 PSI (2 bar). Absolute max.: 100 PSI (6.8 bar)
Gas sample connections	1/4" VCO input and output ports
Electrical connections	Optional 2mm DC power jack, 9 pin "D" for analog & RS-232
Power requirements	9v battery and optional 15-25V AC or DC wall transformer

Features:	
Sensor storage	When not in use the sensor is retracted in a molecular sieve container and kept at an approximate dew point of -80°C. The sample gas pressure activates a piston which automatically moves the sensor into the sampling chamber, thus even low dew points can be measured extremely quickly.
Area classification	Approved for use in hazardous (classified) areas Class I, Div. 1, Groups A, B, C & D. Available as an option.
Input resolution	0.1°C dew point
Indicators	LCD with back-light, 3.5 digits and custom legends for units and mode, audio alert.
Engineering units	°C,°F, PPM, lbs H_2O/mm scf, g H_20/m^3
Controls	5 push buttons, all settings stored in EEprom. Manual Sensor Actuator
Outputs	Optional 4/20mA or 0/24mA and RS-232
Isolation	Sensor and case are isolated from the power supply, analog output and RS-232
Battery saver	Auto power off after 6 minutes
Pressure correct	Programmable pressure correction button