SENSOR TECHNOLOGY
FOR DEW POINT METERS

TECHNOLOGY OVERVIEW

Hyper-Thin-Film (HTF™) Aluminum Oxide Sensor Technology

Reliable

Accurate

Fast

- Patented technology
- High sensitivity
- Completely immune to temperature, electrical noise and even long term drift
- No calibration needed
- Easy maintenance

The breakthrough Hyper-Thin-Film (HTF™) Technology is based on major advances in thin-film technology and metal oxide sciences. It provides measurements with a sensitivity several orders of magnitude larger than of those made with all other technologies. HTF sensors are free of drift and insensitive to temperature changes over most of their range.

Operating Principle

The HTF and all other aluminum oxide sensors share the same basic operating principle: the capacitance measured between the sensor's aluminum core and a gold film deposited on top of the oxide layer varies with the water vapor content in the pores of the oxide layer. Three fundamental structural improvements in the oxide layer give our HTF sensors much increased sensitivity and stability: HTF sensors have much thinner oxide layer, a better defined barrier layer between the aluminum and the aluminum oxide and a unique pore geometry enhancing the entrapment of water molecules.

Hyper-Thin Layer

With the HTF technology, sensors can be produced with hyper-thin oxide layers without compromising insulation strength. The thinner oxide layer of HTF sensors results in much higher capacitance changes because capacitance is inversely proportional to the distance of the capacitor's plates from each other.

The thinner layer also means that water molecules will travel faster in and out of the pores. HTF aluminum oxide sensors therefore respond several times faster than conventional sensors.

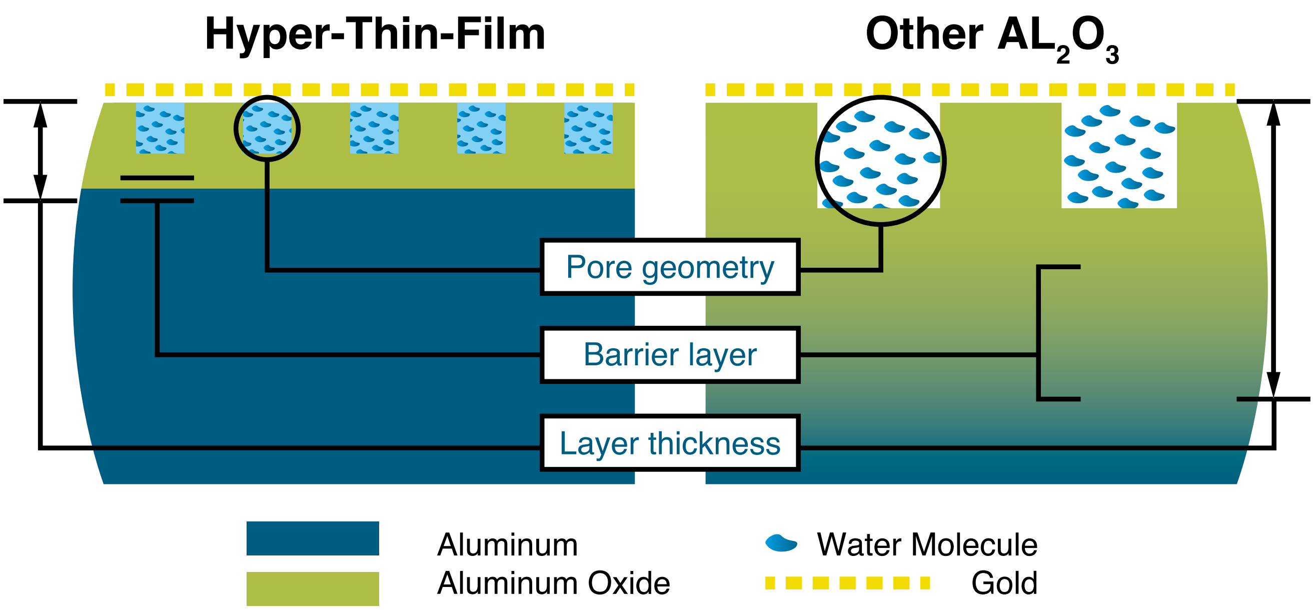
Barrier Layer

In HTF sensors, the transition between the aluminum oxide and the aluminum is sharp and clearly defined. This thinner barrier layer produces a capacitor with its electrodes very close together, which in turn causes the sensor's wet to dry capacitance ratio to be high. The benefit of high wet to dry capacitance ratio is that drift in capacitance due to undesirable factors is less significant. This is clearly a benefit as can be seen in HTF vs. conventional sensor comparisons of temperature sensitivity and aging drift.

The sharp transition from aluminum to aluminum oxide also reduces metal migration, one of the major causes of aging drift in conventional sensors.

Pore Geometry

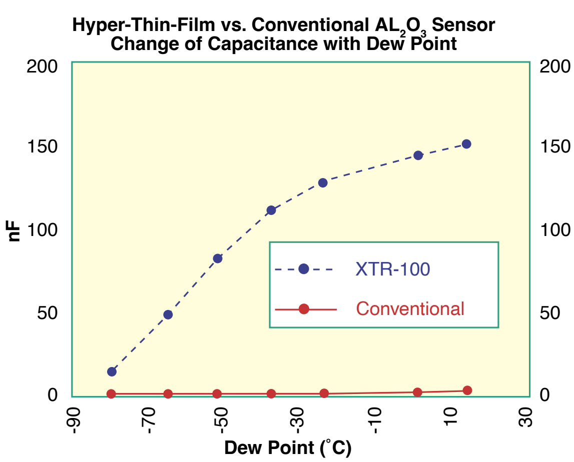
The most significant difference between HTF sensors and conventional sensors is, however, their pore geometry. While conventional sensors rely on hygroscopic aluminum oxide structures to attract water, HTF sensors rely on a pore geometry which slows the Brownian motion of the water breakthrough Hyper-Thin-Film (HTF Technology) is based on molecules when entering the pores.
The freed energy is absorbed by the mass of the sensor and ed on major advances in thin-film the decreased entropy of the water molecules is equalized by an increase in their total number. Technology and metal oxide sciences. This results in more dielectric in the pores and consequently a higher capacitance. HTF sensors require no re-calibration when used in clean, non-corrosive gases.

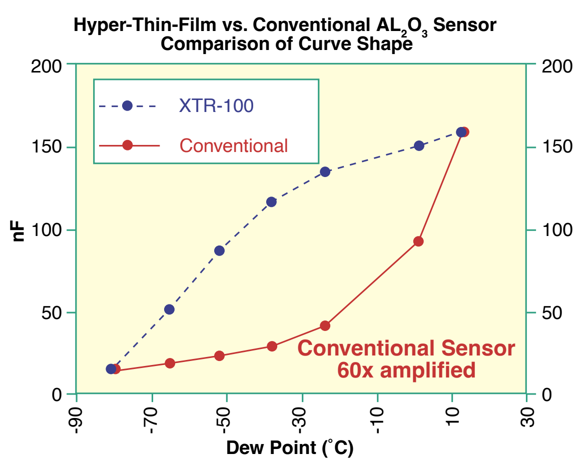


Drawing not to scale

Sensitivity

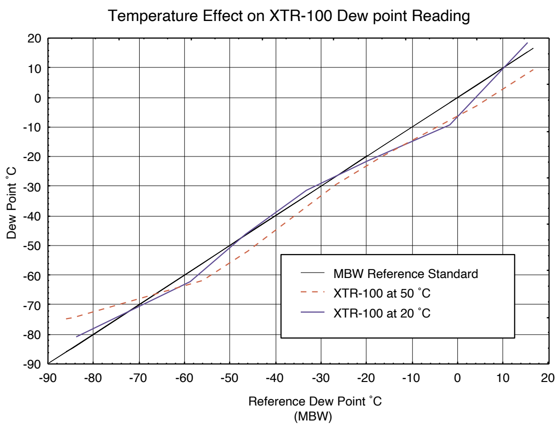
The change of capacitance with moisture of HTF sensors over the full measurement range is 60 times larger than that of conventional sensors. However, because of the better linearity of HTF sensors, at the low end, capacitance changes with moisture are about 600 times larger than that of conventional sensors. The larger sensitivity of HTF sensors make it more stable and almost completely immune to other influences, such as temperature, electrical noise and even longterm drift. It puts HTF sensors in a league by themselves.

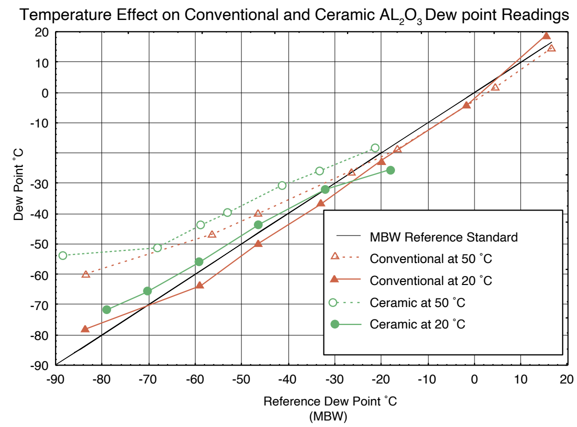




Temperature Coefficient

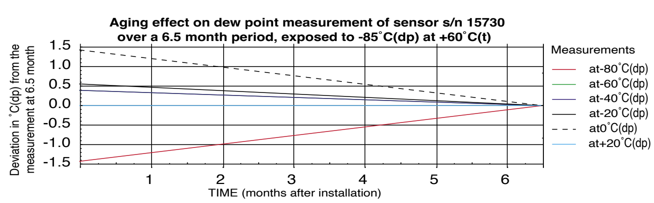
HTF aluminum oxide sensors are completely temperature stable over almost their full range. Only below -70°C(dp) does the measurement become slightly temperature sensitive. Temperature coefficients remain small enough though, to allow for software compensation. The temperature coefficients of conventional and ceramic sensors relative to their sensitivity are too large to allow for an accurate compensation through software.





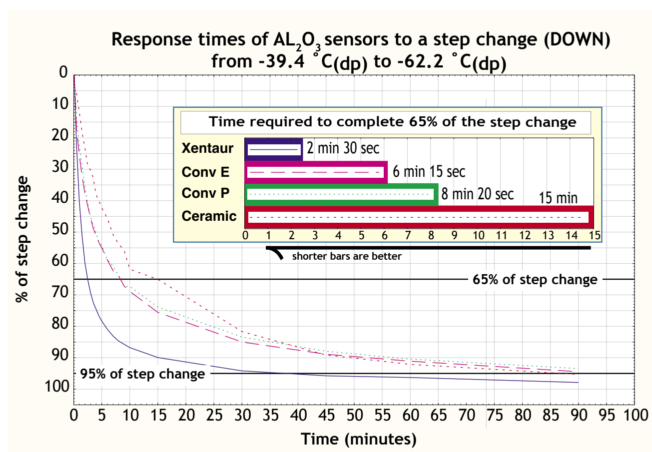
Drift

HTF sensors do not suffer from drift like conventional sensors. Their response curve remains virtually the same even after six month of operation at an elevated temperature.



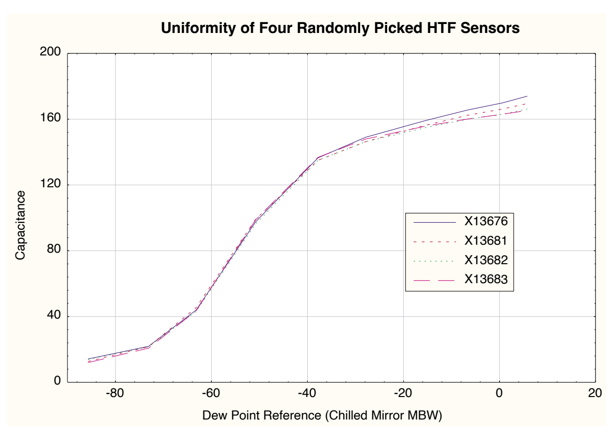
Speed

The thinner oxide layer of HTF sensors results in much faster response times.



Uniformity

HTF aluminum oxide sensors can be manufactured with a high degree of uniformity. Sensors are freely exchangeable in the field with only minor adjustments required at the very extreme ends of the measurement range.



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