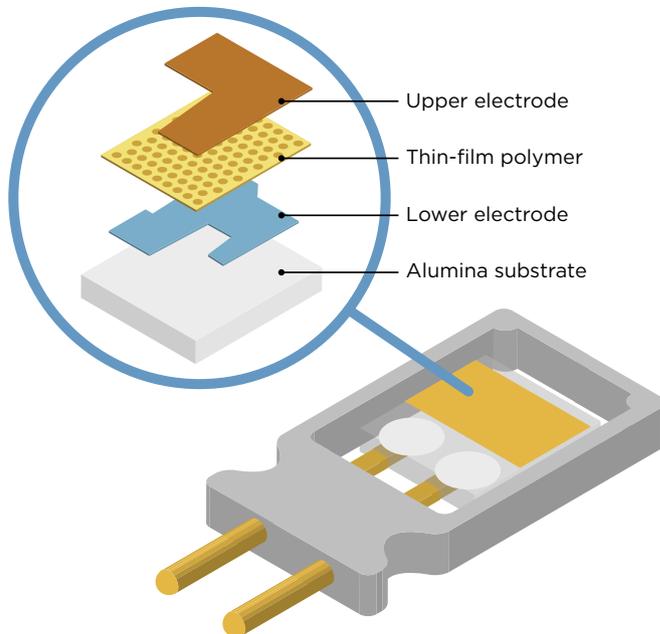


# Vaisala PEROXCAP<sup>®</sup> Sensor for Measuring Vaporized Hydrogen Peroxide, Relative Saturation and Relative Humidity



## PEROXCAP's Unique Benefits

- Repeatable measurement
- Excellent long-term stability
- In addition to H<sub>2</sub>O<sub>2</sub> ppm measurement, the sensor also measures humidity and temperature when combined with an additional temperature sensor.
- Tolerates high humidity and measures accurately even in 100% relative saturation
- Long lifetime of the product
- Accurate measurement with a traceable H<sub>2</sub>O<sub>2</sub> factory calibration
- Long annual calibration interval
- Easy on-site calibration

## Unique capacitive thin-film polymer sensor for repeatable measurement

PEROXCAP sensor technology works using measurements from two HUMICAP<sup>®</sup> sensors. Vaisala HUMICAP sensors guarantee quality and reliability, with their reputation for repeatability, accuracy, excellent long-term stability, and negligible hysteresis even in the most demanding high-concentration H<sub>2</sub>O<sub>2</sub> applications in atmospheric pressure. HUMICAP sensor is a thin-film polymer sensor consisting of a substrate on which a thin polymer film is deposited between two electrodes. The polymer film absorbs or releases vapor

according to humidity changes in the environment. As the humidity changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into a humidity reading.

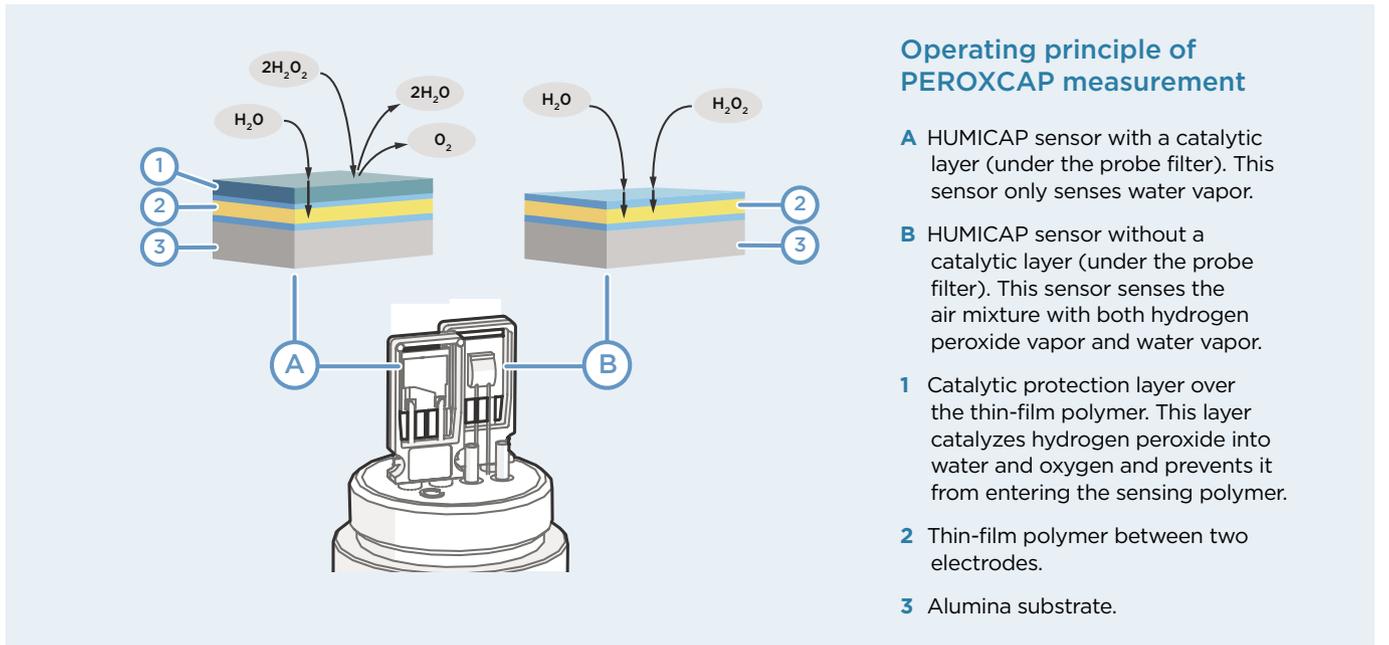
**The upper electrode** is made of corrosion resistant conductive material and functions as one of the two electrodes in the capacitor.

It **protects the active material** of the sensor from dust, dirt and conductive particles. The thin film polymer is sandwiched between the two electrodes. This conductive layer still lets through water and H<sub>2</sub>O<sub>2</sub> vapor .

The advanced upper electrode is one of the secrets behind a cutting-edge humidity sensor.

**The thin-film polymer** absorbs water and H<sub>2</sub>O<sub>2</sub> vapor. The amount is proportional to the ambient relative humidity (sensor with catalytic layer) or relative saturation (sensor without catalytic layer) depending on the sensor in question (A or B). It **amplifies the amount of water and H<sub>2</sub>O<sub>2</sub>** in the air. We synthesize our own polymers in order to optimize its performance.

**The lower electrode** is made of corrosion resistant conductive material and functions as one of the two electrodes in the capacitor.



### Intelligent PEROXCAP measurement technology

PEROXCAP measurement uses two HUMICAP sensors: one HUMICAP sensor with a catalytic layer and the other one without the catalytic layer. The catalytic layer catalyzes hydrogen peroxide from the vapor mixture. Therefore, the HUMICAP sensor with the catalytic layer only senses water vapor, providing a measurement of partial water pressure, i.e. relative humidity (RH). The other HUMICAP sensor without the catalytic layer senses the air mixture with both hydrogen peroxide vapor and water vapor. The difference between the readings from these two sensors indicates the vapor concentration of  $H_2O_2$ .

### Repeatable measurement even in high humidity environments

The PEROXCAP sensor is warmed, which provides reliable measurement even in environments where humidity is near saturation. The heating prevents condensation on the sensor.

The intelligent measurement technology including the chemical purge function helps maintain measurement accuracy between calibration intervals in challenging hydrogen peroxide environments. The purging process involves rapid heating of the sensor to remove possible impurities. The unique PEROXCAP technology has been developed to provide stable and repeatable measurements.

## Up to three measurements for comprehensive bio-decontamination monitoring

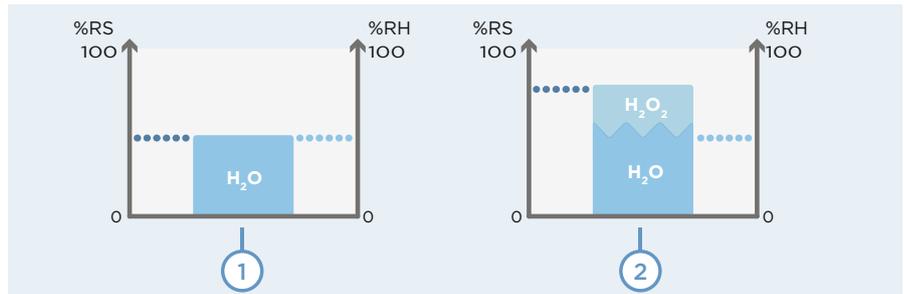
Combining the PEROXCAP sensor with an additional temperature sensor allows up to three measurement parameters: hydrogen peroxide vapor concentration, temperature, and humidity, referring to both relative humidity and relative saturation.

Water and hydrogen peroxide have a very similar molecular structure, and they both affect the humidity of the air in which they are present.

- Relative saturation is a parameter that indicates the humidity of the air caused by both  $H_2O_2$  vapor and water vapor. When relative saturation reaches 100 %RS, the vapor mixture starts to condense.
- Relative humidity is a parameter that indicates the humidity of the air caused only by water vapor.

## Traceable $H_2O_2$ factory calibration

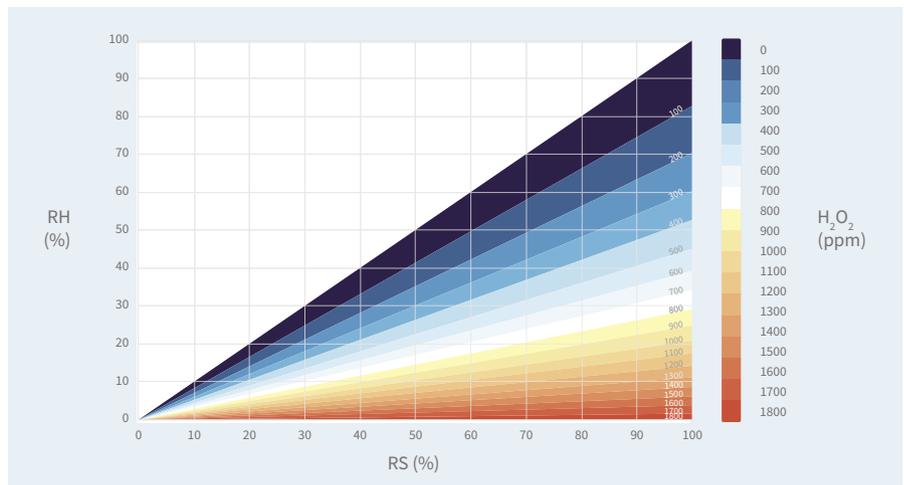
Every PEROXCAP sensor is manufactured at Vaisala's own cleanroom and individually calibrated at the Vaisala factory. Both  $H_2O_2$  and RH calibrations are traceable to international SI units which ensures that the measured values represent the real environment.



### Effect of $H_2O$ and $H_2O_2$ on relative saturation (RS) and relative humidity (RH)

- 1 Space without  $H_2O_2$  vapor. When  $H_2O_2$  vapor is not present, relative saturation equals relative humidity.
- 2 Same space with  $H_2O_2$  vapor introduced. Relative saturation is higher than relative humidity.

For example, at 20 °C with an  $H_2O_2$  concentration of 500 ppm, the humidity level 25%RH is equivalent to 60%RS. When this gas mixture starts to condense, i.e. when RS is 100%, RH is 45%.



As an example, at 20 °C and 500 ppm hydrogen peroxide, the humidity level 25%RH is equivalent to 60%RS. When this gas mixture starts to condense (relative saturation being 100%), relative humidity is 45%.

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