RELATIVE HUMIDITY MEASUREMENT

DEFINITION

A Hygrometer is an instrument used to measure relative humidity (RH) that is the quantity of water vapour present in the air.

Hygrometers are often available in versions, which also measure temperature. These are normally called thermo-hygrometers.

Relative humidity is expressed as the ratio of the quantity of water vapour present in the air to the quantity, which would reach saturation (100%) at a given temperature.

PRINCIPLE OF OPERATION

The measurement system is made up of a meter connected to a probe. The probe uses a capacitance, which is a capacitor with a polymer or plastic dielectric material with a fixed dielectric constant from 2 to 15. Humidity causes the dielectric to dilate, hence distancing the plates with consequent variation of the capacitor's geometry and reaction of its capacitance. These capacitance variations in turn cause a frequency change in the instrument's electronics, resulting in a frequency modulation, which is a function of relative humidity. The
frequency is then converted into voltage, which is converted into a relative humidity value and displayed on the LCD.

The hygrometer's precision essentially depends on how easily affected they are by the following three factors:

1) The "linearity error" caused by the typical non-linearity of RH sensors. Hawco's hygrometers compensate for the effects of this error. It is advisable however to calibrate the meter periodically to reduce the probability of this error re-occurring.

2) The "temperature error" caused by the variation of the hygroscopic properties of the sensor's dielectric material as a function of temperature. In fact, the ratio between the quantity of water vapour present in the dielectric and the relative humidity is not directly proportional, but varies with temperature. Due to this temperature error, hygrometers normally do not operate at temperatures below -20°C (-4°F). The meters in the catalogue compensate for this error automatically.

3) The "calibration error" caused by an incorrect calibration procedure. We recommend using the Hawco humidity calibrator/checker but there are many "do-it-yourself" calibration kits on the market. Most are made of a receptacle containing two sealed chambers and two different types of salt.

It is possible to simulate a particular RH value filling each chamber with the correct distilled water and salt solution. The RH probe is first immersed in the low RH chamber and allowed to stabilise. The meter is then calibrated at the RH value of the chamber being used. The procedure is repeated with the high RH chamber. Since RH is dramatically affected by temperature changes, kits do not provide accurate

calibration due to the practical difficulties in performing the calibration at a constant temperature.

Climatic chambers that simulate different humidity levels are the ideal solution to calibrate hygrometers accurately. Hygrometers are also calibrated using two different levels of relative humidity in this calibration procedure, and then the accuracy is checked by simulation of other RH values in the chamber. Our service support centre is equipped with state-of-the-art calibration chambers to provide the best accuracy.

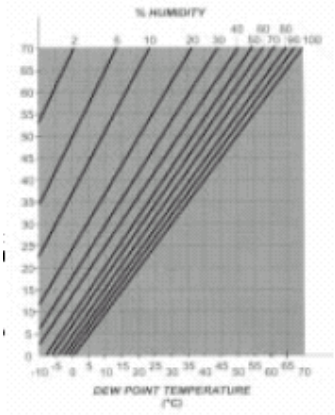
DEW POINT

The dew point is defined as the lower temperature to which air must be cooled in order for condensation (saturation) to occur. The dew point is dependent on the concentration of water vapour present, and therefore the relative humidity.

The graphs here can help to easily determine the dew point after measuring the relative humidity and temperature of the air.

To determine the dew point temperature, start by drawing a horizontal line at the measured temperature level until it intersects the measured relative humidity line.

From the intersection point draw a vertical line down to the dew point axis, and read the dew point temperature.



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