Dew Point Temperature

Frequently Asked Questions

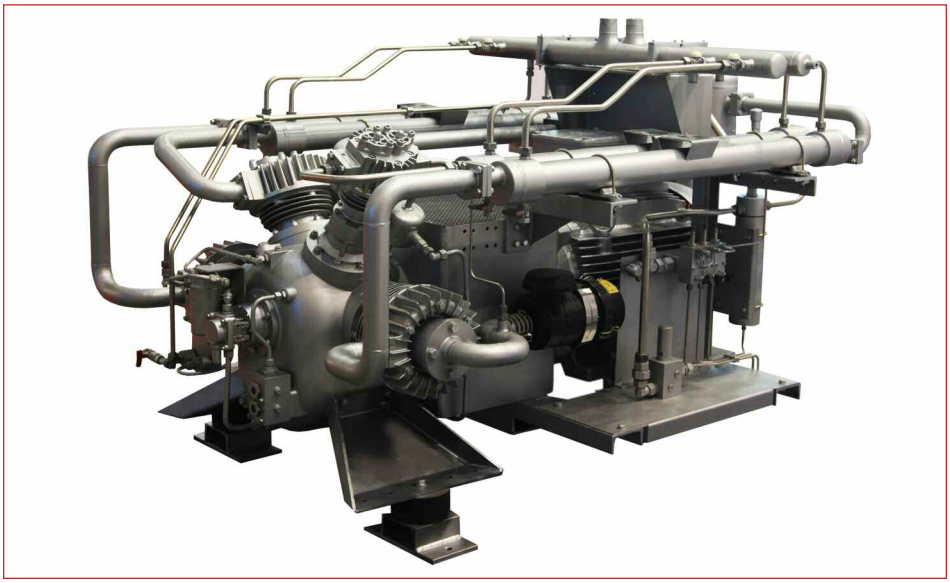
Q. What is dew point temperature?

A. Dew point temperature (commonly referred to as 'dew point' or 'dewpoint') is the temperature at which water vapor in any gas at constant pressure begins to condense into liquid water at the same rate as it evaporates. If the air temperature is equal to or below the dewpoint, water condensation will occur meaning water vapor will transform from the vapor state into the liquid state. Condensed water will appear as dew on a surface and may also appear as a cloud or fog suspended in the air.

When the air temperature is equal to the dew point temperature, the air is at the saturation point and the relative humidity is 100%. The greater the difference between air temperature and dewpoint, the lower is the relative humidity.

Q What is frost point?

A. Frost point is the temperature (usually below 0°C or 32°F) at which water vapor condenses as frost instead of liquid water. A more scientific definition; frost point is the temperature at which air is saturated with respect to water vapor over a surface of ice. Frost point will be a different measurement than dewpoint below 0C.



Industrial air compressors require reliable dew point measurement.

Desiccant dryers for compressed air typically operate at -40° frost point.

Q. When should I choose dew point as the parameter I measure?

A. Dewpoint is an ideal measurement when your goal is to avoid condensation or to know when condensation is about to occur. It is fairly common to measure the difference between ambient temperature and the dew point temperature. The alarm point for condensation, for example, can be set at a difference of 10 degrees between ambient temperature and dewpoint.

Dewpoint is also an ideal measurement for very dry conditions (<10% relative humidity). Dewpoint can be equated to the absolute amount of water vapor present as long as the air pressure remains constant. Most direct dewpoint measurement technologies are more suited to measuring very low amounts of moisture compared to relative humidity measurement technology.

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Dewpoint is also ideal for compressed air systems because condensation is a concern as the air is compressed in the system. The dewpoint changes with pressure which can create condensation in the compressed air system.

Q. What are the pros and cons of measuring dew point versus relative humidity?

A. Dewpoint measurement technology is usually more expensive and more accurate than relative humidity measurement technology at low dewpoints. Dewpoint sensor reaction time is usually slower than relative humidity sensor reaction time. In some cases, dewpoint sensors can take several hours to settle where RH sensors may take only a few minutes. Some dewpoint sensors are highly sensitive to contamination in dirty process air causing frequent calibration and sensor maintenance.

Q. Does the dew point change when the system temperature changes?

A. No. Dewpoint will not change as the system temperature changes below the saturation point. If the system temperature is at or below the dewpoint temperature in a closed system, the dewpoint will change because water vapor is removed from the air. It is a common misconception that changes in temperature will affect the dewpoint. It is important to remember that dewpoint is independent of the ambient temperature (exception noted above). Only changes in pressure or the actual amount of water vapor present will affect the dewpoint.

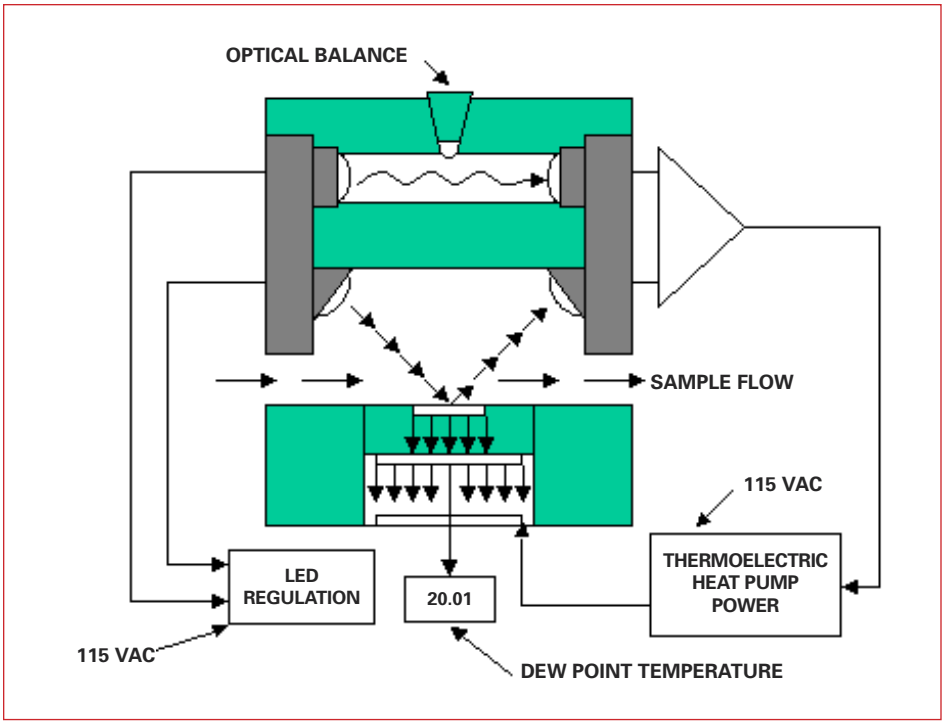

IMAGE SOURCE - THUNDER SCIENTIFIC

Schematic of conventional chilled mirror sensor.

Q. How does pressure affect dew point measurement?

A. As the pressure of a system increases, the dew point temperature will rise and approach saturation. Dewpoint is a common measure in compressed air systems because it is possible to reach the saturation point and introduce liquid water into the compressed air by simply increasing the pressure. As the pressure of a system is decreased, the dew point temperature becomes lower and the gas will become relatively dryer as the difference between dew point and ambient temperature increases. This is why systems that are maintained in a vacuum state are typically very dry.

Q. What are the most common types of technology for measuring dew point?

A. The condensation hygrometer or chilled mirror is the most well known technology for dew point. The chilled mirror is a direct measurement of the dew point temperature as compared to a calculated measurement achieved with a relative humidity sensor. Chilled mirror

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technology is very precise, very expensive and requires technical expertise as well as high maintenance of the instrument.

Another common technology is to measure relative humidity and temperature to calculate the dew point temperature with accepted scientific formulae. For this type of technology to be accurate in dry conditions, the sensor must be enhanced with additional technology or processing software.

Aluminum oxide is another common technology which is very effective in environments with trace amounts of water vapor and dewpoints as low as -100°C. However, this technology is not reliable as moisture increases or in dirty process gas streams.

Q. Isn't dew point temperature the same as wet bulb temperature?

A. This is a common misconception and is both true and false. Wet bulb temperature is equal to dew point temperature when the air is saturated. At any other point below saturation, the two measurements are very different. The measurements are also made using very different technologies.

Q. How do I know which technology is best for my application?

A. Your choice of technology will depend on several factors including your objective for the measurement, the amount of water vapor present, the ambient temperature and pressure, the level of contaminants present in the gas and your budget. It's best to consult with a measurement expert or engineer to determine the best technology for your particular application. It is fairly easy to choose the wrong technology in critical applications causing significant problems in sensitive processes.

Q. Where can I buy a dewpoint instrument?

A. Rotronic Instruments offers a line of dewpoint instruments including portable meters and fixed transmitters. The Rotronic dew point probe uses a relative humidity sensor and a temperature sensor to calculate the dew point temperature at a fixed pressure. An advanced, proprietary algorithm allows the Rotronic technology to measure in very dry conditions (as low as -70°C dew point. <5ppm water vapor, <.02% RH). Visit www.rotronic-usa.com/dewpoint to learn more about the Rotronic dewpoint instruments.