

Sensor Glossary



Absolute Humidity - the mass of water vapor in a unit volume of gas mixture

Absolute Pressure - the pressure exerted on a vacuum

Acceleration - the time rate of change of velocity

Adiabatic - a process which takes place without any exchange of heat between a system and its surrounding

Ambient - surrounding or prevailing conditions

Ampere or Amp - the metric unit for electric current

Amp-Hour - a quantity of electricity equal to the integral of the current with time.

Anemoclinometer - a device for measuring the inclination of the wind to a horizontal plane

Anemometer - a device for measuring wind speed

Ångstrom - a unit of length defined as 1/6438.4696 of the wavelength of Cadmium red line, very close to 10^{-10} meter

Aspiration - using a partial vacuum to draw up gas

Backlash - similar to hysteresis but more commonly applied to mechanical systems

Barometer - an absolute pressure gauge for measuring atmospheric pressure

Baseline - a reference set of data against which operating data is compared

Bathometer - a device for measuring depth in water

Blackbody - an object that absorbs all incident radiation regardless of spectral or directional composition. A black body will also radiate energy at a rate expressed by the Stefan-Boltzmann Law with a spectral distribution expressed by Planck's radiation equation

Bolometer - an infrared detector that functions by measuring the heating effect of the incident radiation

Bourdon Tube - a pressure sensing element constructed from a flattened tube, seal at one end, twisted or curved. Applied pressure untwists the tube

Bridge - an electronic network that effectively provides zero offsetting

Buckley Gauge - a device that measures very low pressures by sensing the ionization current flow

Calibrate - to ascertain the relationship between the input and output of a sensor or measuring device

Calorie - a Unit of heat equal to that required to raise the temperature of 1 gm of water 1°C and is equivalent to 4.184 joules. Some confusion exists when used in the context of food where the kilocalorie is used and termed the "large calorie" but more commonly just "Calorie"

Candela - unit for luminous intensity as related to human eye spectral response

Ceilometer - a device for measuring the height of the base of clouds

Celsius - scale of temperature measurement

Centigrade - obsolete term for Celsius temperature scale

Cerenkov Radiation - visible light produced when charged particles pass through a transparent medium at a speed exceeding the speed of light in that medium

Color Code - a coding system for identifying a specific type of object within a class of object.

Conductivity (electrical) - the property of a water sample to transmit electric current under a set of standard conditions. It is the inverse of resistance and expressed in units of Siemens

Cryogenic - any process carried out at very low temperature - say below -50°C

Cryometer - a low temperature thermometer

Curie Point - the temperature at which a magnetic material loses its magnetic properties

Dalton's Law - the total pressure exerted by a mixture of gases equals the sum of the pressures that would be exerted if each of the individual gases present were to occupy the same volume by itself

Dark Current - the current that flows in a photo sensor when there is no incident radiation. Often temperature dependent

Decibel - a logarithmic unit for measuring relative strength of a signal

Dew Point - the temperature at which condensation from the vapor phase occurs

Diffraction Grating - an array of fine, equally spaced reflecting or transmitting lines, which diffracts light in a direction characteristic of the wavelength of the light

Doppler Shift - a phenomenon that causes waves to have a longer wavelength if the source and observer are moving apart and conversely becomes shorter if they are moving together. Very useful effect for flow and speed measurement

Drift - an undesired change in output over a period of time that is unrelated to input. Can be due to aging, temperature effects, sensor contamination etc

Drosometer - a device for determining the amount of dew that condenses on a given surface

Dry Bulb Temperature - the temperature of the air. Used in conjunction with the wet bulb temperature to measure humidity.

Eddy Current - an AC current setup near the surface of a conductor exposed to an electromagnetic field

Electrolevel - a sensor for detecting inclination changes. Consists of a conductive fluid and an air bubble in a seal chamber with three or more electrodes. Used in a bridge circuit with AC excitation. Can be very sensitive although can be prone to drift

EMC - ElectroMagnetic Conformance - standards associated with the emission of undesired radio frequency energy by devices and the level of susceptibility of a device to similar energy

Encoder (sensor) - a device that converts a linear or rotary displacement into digital representation

Erg - unit of energy in the CGS system of units. $1 \text{ erg} = 10^{-7} \text{ joules}$

Eudiometer - a device for measuring electric current by measuring the volume of gas produced at electrodes during electrolysis

Evaporimeter - and instrument for measuring evaporation rates, particularly of water into the atmosphere

Excitation - power applied to a sensor to enable it to function

Extensometer - a device for measuring small changes in length. Used in geotechnical and materials science areas.

Fahrenheit - a temperature scale still in use in USA

Ferrography - the science of sampling lubricants from machines and analyzing the size distribution of wear particles

Fiber Optic Sensors - a sensor based on some optical property that can be detected by light reflected back through an optical fiber. While expensive, these sensor are safe in hazardous environments

Filter - a circuit or a software program that is able to reduce unwanted noise, thus improving the signal to noise ratio

Fixed Point - or defining point - a reproducible standard value, usually derived from a physical property of a pure substance. For example the triple point of pure water defines a temperature of 0.010°C

Floating - a condition where the voltage on a line relative to a reference point is not defined due to the lack of an electrical connection or due to very high source impedance

Flow Meter - an instrument to measure volume or mass flow of a fluid in a pipe or channel

Gage Pressure - a measure of pressure relative to prevailing atmospheric pressure

Galvanometer - an instrument for measuring small electric currents the movement of a current carrying coil in a magnetic field

Gauss Meter - an instrument for measuring the intensity magnetic fields

Geiger-Muller Counter - a radiation measuring instrument based on a high voltage (200V to 1000V) gas filled tube that detects charged particles using amplification by an avalanche process

Grey Code - a generic term for a family of binary codes that have the characteristic of changing only one bit in the code where incrementing or decrementing a single number in the code. This is done to overcome the potential ambiguity caused by uncertainty about the precise point when individual bits in a non-Grey code flip due to a change of input

Ground - a neutral reference for electrical potential, generally the potential of the Earth's crust

Hall Effect - a voltage developed as a result of current flow in the presence of a magnetic field. The voltage is at right angles to both the current and the magnetic field. The effect is strongest when the speed of the current carriers is greatest as is some semi-conducting materials

Hertz - the unit of frequency - cycles per second

Humidity - an absolute (by mass or volume) or relative measure of the amount of water vapor in air

HVAC - Heating, Ventilating and Air Conditioning. An acronym used in building and control industries

Hydrometer - a device for indicating the specific gravity of a fluid

Hygrometer - a device for indicating humidity

Hysteresis - A characteristic of materials, sensors and sometimes instruments to make their behavior dependent on the immediate history to which they have been subjected. Typically the final settling point is different when approached from above to when it is approached from below

Impedance - the complex ratio of a force like parameter to a related velocity like parameter. For example temperature to heat flow, voltage to current, pressure to flow

Impulse Excitation - A method of measuring the response of a system by applying a short, sharp pulse

Inclinometer - a device for measuring the change of angle relative to the direction of gravitational pull

Indicator - a device to display the value of a parameter

Infrared - any electromagnetic wave whose wavelength is between 0.78 and 300 μM

Instrument - a device for measuring the value of an observable parameter. The device may display, record or otherwise process the measurement

Integrator - a device that mathematically integrates and input. For example an integrator connected to a flow meter will output the volume passed since last reset

Intrinsic Safety - A protection method for use in potentially explosive atmospheres that limits the energy available to create a spark or heat surfaces

Ionization Gauge - a pressure sensor based on conduction of electric current through ionized gas
Useful below 100 Pa

IP Code - a coding system to describe the level of protection against the penetration by solids and liquids provided by an enclosure or case for equipment.

IRGA - Infra Red Gas Analyzer - an instrument able to measure some types of gas in a gas mixture by measuring their characteristic infrared absorption

Johnson Noise - thermally induced electrical noise in resistive elements

Joule - a unit of energy in the MKS units system

Kalman Filter - a process for estimating the value of parameters in the presence of noise and time delays.

Kelvin - an absolute temperature scale.

Konimeter - a device for measuring dust concentration in air by collecting dust on a glass slide ready for counting under a microscope

Leakage - an undesired electric current path from signal wires to ground or other destination. Leakage can introduce significant errors with high impedance sensors

Linearity - The degree of conformity of the output of a system to a straight line match with the measured parameter

Load Cell - a transducer for the measurement of force or weight, usually based on a strain gauge bridge or vibrating wire sensor

Loudness Level - A measure of sound intensity. Expressed in decibels relative to a pressure of 20 μ Pa at 1 kHz

Lumen - a unit of light flux visible to the human eye

Luminance - the luminous intensity of a surface in a given direction per unit of projected area in a plane perpendicular to that direction

Lux - metric unit of illuminance

Magnetometer - an instrument for measuring the strength of a magnetic field

Manpower - in the physical world a unit of power equivalent to 74.60 watts. Obsolete

Mass - the amount of matter in an object, not to be confused with weight which is the result of gravity acting on a mass.

Meter - See <http://www.flowmeterdirectory.com/meter.html>

Noise - The generally unwanted component of a signal that tends to interfere with the measuring process. The noise can be random or periodic, and often varies in intensity

Odometer - a device that displays the distance traveled by a motor vehicle

Ohm - a unit of electrical resistance

Oleometer - a device for measuring the specific gravity of oil as a means of determining purity.

Olfactometer - an instrument for measuring the sense of smell by issuing known concentrations of odorous materials.

Pachymeter - an instrument for measuring the thickness of material, particularly paper

Parameter - in the context of sensors, the thing that is being measured

Pedometer - a device for measuring the distance walked

Penetrometer - an instrument for determining the strength of semi-solids such as grease, wax and soil

Peltier Effect - the observable effect of a voltage generated by a temperature gradient in two wires of dissimilar metals joined at one end. See

pH - logarithmic measure of the hydrogen ion concentration in water. It is measured with a pH electrode

Phytometer - a device or system for measuring the transpiration of plants

PID - Proportional-Integral-Derivative - refers to a control method where the controlling signal is a function of the error, the error's history and the error's rate of change

PIN Photo-diode - a semiconductor light detecting diode with a particularly fast response time

Pirani Gauge - a sensor for low pressures (<100 kPa) that utilizes the pressure dependent effect of thermal conductivity between air and a heated wire

Pitot Tube - a sensor to measure fluid velocity by generating a pressure that is the difference between the total static pressure and the dynamic pressure

Piezoelectric Effect - the generation of electric charge by certain materials when a force is applied, or conversely the deformation of the material when a potential is applied. Usually electrodes are deposited or attached to the material to facilitate electrical coupling

Planck's Equation - an equation defining the radiation emitted by a blackbody.

Pyroelectric Effect - the generation of electric charge by certain materials when heat is applied by conduction or radiation

Quantization - the sub-division of the range of a reading into a finite number of steps, not necessarily equal, each of which is assigned a value. The concept is particularly applicable to analog to digital and digital to analog conversion processes

Quantum noise - noise due to the discrete or particular nature of light and other short wavelength electromagnetic radiation

Quartz - a transparent crystalline mineral of silica that finds application in sensors due to its optical and piezoelectric characteristics

Radiation Shield - in air temperature measurement a vented and reflective enclosure to shield a sensor from incident infrared radiation. See the [Temperature](#) page. In the nuclear field a heavy shield to absorb high energy subatomic particles

Raoult's Law - a dissolved substance will lower the partial pressure of the solvent proportionally to the mole fraction of the dissolved substance. Useful phenomena for the calibration of humidity sensors.

Reynolds Number - an important dimensionless number associated with fluid flow and used in scaling fluid systems and in determining the transition point from laminar to turbulent flow. It represents the ratio of the momentum forces to the viscous forces in the fluid flow

RTU - Remote Transmitter Unit - a device accepts data from a range of sensors and telemeters the information to a distant destination for recording and processing. RTUs can also receive instructions and act on them as part of a control loop

Scale factor - a constant multiplier which converts an instrument reading to a measured value in standard units for the parameter being measured

Scanner - a switching device that enable a single measuring instrument to sequentially sample multiple sensors

Self Heating - a generally undesirable characteristic of some types of sensors, particularly temperature sensors, to be heated by the excitation power required to obtain a reading.

Sensitivity - the smallest change in a physical quantity or parameter that can be detected by a measuring system. Determined by signal to noise ratio, system amplification and / or quantizing limit

Sensor - a device that detects the value or the change of value of a physical quantity or parameter and converts the value into a signal for an indicating or recording instrument. Also see Transducer

Stevenson Screen - a radiation shield used to house outdoor meteorological instruments

Strain Gauge - a device that responds to mechanical strain. Metal foil gauges are the most common type, responding to strain with a small change in resistance. Also vibrating wire types

Tachometer - an instrument for measuring the speed of rotation

Telemetry - The process by which measured quantities from a remote site are transmitted to a data collection point for recording and processing

Temperature - a measure of the amount of heat in an object expressed in degrees on one of the established temperature scales

Test Bench - Air Test Benches. Used to gather performance data. Air Flow Test Benches are used for example in determining fan performance as well as for air side enthalpy measurements for test heat exchangers. The more common test bench is a standard product but specialty companies design and manufacture custom built air test benches with manual controls or fully automatic data acquisition and control

Thermistor - a temperature sensor based on the high temperature coefficient of resistance of certain semi-conducting materials.

Thermocouple - a temperature sensor based on voltage produced by a temperature gradient in two wires of dissimilar metal joined at one end.

Thermopile - an array of usually series connected thermocouples designed to increase signal level and or provide a degree of spatial temperature averaging.

Time Constant - The time required to complete 63.2% of the total rise or decay after a step change of input. It is derived from the exponential response $e^{-t/T}$ where t is time and T is the time constant

Time Series - a sequence of data assigned specific moments in time. It is the history of the object of interest

Torque - a rotary force

Transducer - a device that converts an input signal of one form into an output signal of another form. Often used interchangeably but not necessarily correctly with sensor. In this work, "sensor" generally refers to the "raw" sensing element which is strictly speaking a transducer, and the term "transducer" is used to describe a sensor with some signal conditioning within the package

Turbidity - the optical opacity of water containing suspended matter. Measured with a nephelometer

Tyndall Effect - the side ways scattering of light passing through a transparent fluid containing suspended material

Ultrasonics - the technology associated with the use of sound above 15 kHz. Applied to thickness, density, flow and level sensing. Also used for imaging

U-Tube Manometer - a sensitive means of measuring low pressures by use of a partially fluid filled U shaped tube. Suitable for gauge and Differential pressure measurement

Vapor Pressure - the pressure (at a given temperature) at which a liquid is in equilibrium with its vapor

Venturi Meter - a flow meter that measures flow rate by determining the pressure drop through a venturi constriction

Vibrating Plate Electrometer - a means for measuring high impedance voltage source using a capacitor with a vibrating electrode to rapidly change the capacitance. The resulting small current flow can then be measured via series resistor

Vibrating Wire Strain Gauge - a device that responds to strain by changing its natural resonant frequency. The wire is electrically plucked and the frequency measured. Alternatively wire can be maintained in continual vibration with appropriated circuits

Viscosity - a measure of internal friction of a fluid. Metric units of viscosity are poise, however there are a number of other units used in industry, particularly for lubricants and sugar.

Volt - a unit of electromotive force or potential difference

Vortex Flow Meter - a sensor that detects the frequency of vortex shedding behind an obstacle in flowing fluid by small pressure variations

Warm-up Period - the time it takes a circuit to stabilize after the application of power.

Watt - the metric unit of power

Wet-Bulb Temperature - the lowest temperature a wetted body will attain when exposed to an air current. It is the temperature of adiabatic saturation.

Wheatstone Bridge - a four arm resistance bridge having 1, 2 or 4 variable resistances. It is commonly used with resistance based sensors, especially strain gauges and RTDs. It is effective in suppressing to zero point thus allowing higher amplification and for temperature compensation

Wien Bridge - a type of AC bridge, now rarely deployed

Wind Chill Factor - a factor applied to temperature that attempts to better represent the feel of low temperature, wind and humidity on people

Wollaston Wire - a fine platinum wire used in hot wire anemometers. It is made by drawing a silver sheathed platinum wire and dissolving the silver with acid. Is being replaced with micro-machining methods

Zero Suppression - a process used to increase system sensitivity of sensors with a large output offset. By suppressing the zero, higher amplification may be applied. The bridge circuit is an example