

Definitions for Instrumentation

1-Hour Ozone Standard – The current indicator of air quality acceptability as it pertains to ground-level ozone. This indicator involves taking an average 1-hour concentration of pollutants. The current threshold is 0.12 parts per million (ppm). An area meets the ozone National Ambient Air Quality Standard if the monitored ozone level does not exceed the standard more than three times over a consecutive three-year period.

8-Hour Ozone Standard – This is the proposed indicator of air quality acceptability as it pertains to ground-level ozone. The current threshold value for this standard is 0.08 parts per million (ppm), measured as maximum daily 8-hour average concentrations. To attain the ozone National Ambient Air Quality Standard, the 3-year average of the annual 4th-highest daily maximum 8-hour ozone concentration must be less than or equal to 0.08 ppm.

Accuracy – Accuracy is the measure of exactness of an analytical method or the closeness of agreement between the conventional, true value or an accepted reference value and the value found. It is measured as the percentage of analyte recovered by assay by spiking samples in a blind study. Statistical tables and control charts are commonly used as graphical illustrations of accuracy.

Adoption – Rules are adopted by the Texas Commission on Environmental Quality commissioners. Rules are enforceable at the state level upon adoption by the commission, and are enforceable at the federal level upon approval the Environmental Protection Agency.

Aerosol – A colloidal system in which a gas, frequently air, is the continuous medium and particles of some liquids are dispersed in it. Aerosol thus is a common term used in connection with air pollution control. Settling velocity is very low so particles stay in suspension for long periods of time.

Air Quality Classifications (Ozone) – For the ozone National Ambient Air Quality Standard, an area's attainment status is defined by a "classification", as represented below:

- Extreme: Area has a design value of 0.280 ppm and above.
- Severe 17: Area has a design value of 0.190 up to 0.280 ppm and has 17 years to attain.
- Severe 15: Area has a design value of 0.180 up to 0.190 ppm and has 15 years to attain.
- Serious: Area has a design value of 0.160 up to 0.180 ppm.
- Moderate: Area has a design value of 0.138 up to 0.160 ppm.
- Marginal: Area has a design value of 0.121 up to 0.138 ppm.
- Section 185A (Previously called Transitional): An area designated as an ozone nonattainment area as of the date of enactment of the Clean Air Act Amendments of 1990 has not violated the national primary ambient air quality standard for ozone for the 36-month period commencing on January 1, 1987, and ending on December 31, 1989.
- Incomplete (or No) Data: An area designated as an ozone nonattainment area as of the date of enactment of the Clean Air Act Amendments of 1990 and did not have sufficient data to determine if it is meeting or is not meeting the ozone standard.

Analyzer – Provides both quantitative and qualitative measurements of the composition of a mixture or compound. Not necessarily continuously.

Analyzer Cabinet – An enclosed housing in which analyzers are installed singly or grouped together. Maintenance is carried out from outside the cabinet with the door(s) open.

Analyzer Case – An enclosure forming part of the instrument.

Analyzer House – An enclosed building or part of a building containing one or more process analyzers and associated equipment where streams for analysis are brought in and which is regularly entered by authorized personnel. Either natural or forced ventilation is used. The maintenance of the analyzer is normally carried out from within the house.

Analyzer Shelter – A structure with one or more sides open and free from obstruction to the natural passage of air, in which one or more analyzers are installed. The maintenance of the analyzer is normally performed in the protection of the shelter.

Attainment Demonstration – A plan to show (or demonstrate) how the nonattainment area expects to meet (or attain) National Ambient Air Quality Standards by the deadline.

Bias – Systematic error; true minus predicted; “inaccuracy”.

Boiling Point – At a given pressure, the temperature at which molecules move fast enough to escape from the liquid surface. Solvents with low boiling points generate more vapor at a given ambient temperature than those with high boiling points. They are said to be volatile and are a high risk to store and handle. Solvents with high boiling points produce little vapor unless they are at an elevated temperature. The fire risk is therefore lower.

By-Pass Filter – A filter in which only the analyzer sample passes through the filter medium. The fast loop passes through the filter housing and may scour the filter element producing a self-cleaning effect.

By-Pass Sample Loop – A sample circulating system from the process to a vent or drain.

Calibration – Modeling procedure by which a response is transformed into a useful statement.

Calibration Design – The deliberate plan used to obtain empirical data from which a calibration relationship can be determined and estimated.

Calibration Solution – A solution of known value of the property being measured, used for periodic calibration and for various performance tests.

Carbon Black – An amorphous form of carbon produced commercially by thermal or oxidative decomposition of hydrocarbons and used principally in rubber goods, pigments, and printer’s ink.

Catalytic Sensor – A heated platinum coil coated with a catalyst that reacts by changing its surface temperature in the presence of combustible vapors or gases. The catalytic sensor performs best when used as an area monitor. It is not well suited for constant exposure to process levels of solvent vapors or for the measurement of vapor mixtures.

Closed Loop Control – Control achieved by feedback, i.e. by measuring the degree to which actual system response conforms to desired system response and utilizing the difference to drive the system into conformance.

Coefficient of Variation – The measurement of precision, coefficient of variation = the standard deviation of measured values divided by the mean or true measurement; often expressed as a %; same as relative standard deviation.

Colloid – A solid, liquid, or gaseous substance made up of very small, insoluble, non-diffusible particles that remain in suspension in a solid, liquid, or gaseous medium of different matter.

Combustion – The rapid oxidation of a substance involving heat and light.

Confidence Interval – A pair of confidence limits (an “upper” and a “lower”) used to bracket the true value of a statistic.

Control Strategy – Measures to deal with air pollution. Examples of control strategies include an emissions trading program or vehicle inspection and maintenance.

Coriolis Effect – An effect whereby a body moving in a rotation frame of reference experiences the Coriolis force acting perpendicular to the direction of motion and to the axis of rotation. On earth, the Coriolis effect deflects moving bodies to the right in the northern hemisphere and to the left in the southern hemisphere. The Coriolis effect or Coriolis force is a manifestation of inertia that Gaspard-Gustave Coriolis, a French scientist, first described in full in 1835.

Critical Level – Below this level, a measurement cannot be distinguished statistically from zero because of measurement noise.

Decant – To draw off the upper layer of liquid after the heaviest material (a solid or another liquid) has settled.

Delay Time (T_{10}) – The time interval from the instant a step change occurs in the value of the property being measured to the instant when the change in the indicated value passes (and remains beyond) 10% of its steady-state amplitude difference. In cases where the rising delay time and falling delay time differ, the different delay times should be specified.

Detection Limit – The minimum concentration of an analyte (substance undergoing analysis) detectable at a known confidence level. The term generally applies to laboratory testing and may vary depending on the method of analysis.

Diffusion – The movement of molecules away from a region of high concentration to a region of lower concentration. The term “diffusion” denotes the process by which molecules or other particles intermingle as a result of their random thermal motion. If an enclosure contains two gases, the lighter initially above, the heavier below, they will instantly begin to mingle because of their molecular motion.

Direct Sequence Spread Spectrum – Different from frequency hopping. Instead of splitting a data signal in pieces, direct sequencing encodes each data bit into a longer bit string, called a chip. Usually, 11 to 20 bits are in for the chip, depending on the application.

Drift – The change of indication of an analyzer, for a given value of the property being measured, over a stated period of time, under reference conditions which remain constant and without any adjustment to the analyzer by external means.

Electrochemical Analyzer – An instrument that provides an indication of a specific property of a medium by use of a sensor, which responds to ions from electrolytes, (or ions generated from reactions with non-electrolytes) in that medium.

Electrochemical Sensor – Sensors that change response with the absorption of substances such as Oxygen, Hydrogen, Hydrogen Sulfide, Carbon Monoxide, Sulfur Dioxide, Chlorine, and Nitrogen Dioxide. Used primarily as area monitors.

Electromotive Force – An invisible force surrounding any electrical wire or device. It has two components – the electric field, which is the result of voltage, and the magnetic field, which is the result of current flow.

Electronic Unit – The device converting the electrical signal from the sensor to a defined, scaled output signal.

Emulsion – The suspension of one liquid ad minute globules in another liquid as, oil dispersed in water.

Endothermic – Characterized by or formed with absorption of heat.

Error – Deviation of a measured or predicted value from the true value; the indication of a measuring instrument minus the (conventionally) true value of the property being measured.

Exothermic – Characterized by or formed with evolution of heat.

Expert Systems – Software that behaves in much the same way as a human expert would in a certain field of knowledge. An expert system is a class of computer programs developed by researchers in artificial intelligence during the 1970s and appeared commercially beginning in the 1980s. The programs are a set of rules that analyze information, usually supplied by the user of the system, about a specific class of problems, as well as provide analysis of the problem, and recommend a course of action for correction.

Explosion – Rapid, uncontrolled combustion process which generates a high temperature, a large volume of gas, and a pressure or shock wave.

Explosive Gas Atmosphere – Mixture with air, under atmospheric conditions, of a flammable material in the form of gas or vapor in which, after ignition, combustion spreads through the unconsumed mixture.

F-test – A statistical test of the significance of the ratio of two mean square errors (e.g., used to judge whether there is evidence that two sample variances are statistically different, or whether a model is statistically significant).

Fast Loop (Fast Circulating Loop) – A sample circulating system from the process to the process, with sample usually removed via a by-pass filter within the loop.

Flammability Range – Flammable gases/vapors have limits below, and above, which flame propagation does not occur. The volume below which flame propagation does not occur is called the Lower Explosive (or Flammable) Limit (LEL). Below this concentration the mixture is said to be too “lean” for a flame to propagate. The volume of gas/vapor in air above which a flame does not propagate is called the Upper Explosive Limit (UEL).

Flashpoint – Lowest liquid temperature at which, under certain standardized conditions, a liquid gives off vapors in a quantity capable of forming an ignitable vapor/air mixture.

Frequency Hopping Spread Spectrum – A type of radio transmission in which the transmitter and receiver hop in synchronization from one frequency to another according to a prearranged pattern.

Gain – The ratio of output signal magnitude to input signal magnitude in a control system.

Gamma, γ – The significance level associated with the limit in question (i.e., either the upper or the lower limit).

Gas – A state of matter, in which the molecules move freely and consequently the entire mass tends to expand indefinitely, occupying the total volume of any vessel into which it is introduced. Gases follow, within considerable degree of fidelity, certain laws relating their conditions of pressure, volume, and temperature. Gases mix freely with each other, and they can be liquefied through compression or temperature reduction.

Gas Chromatography – A method of measuring the volatile chemical constituents of a substance. It is one of four objective tests used to determine the quality, identity, and purity of every essential oil. Gas chromatography analysis produces a “fingerprint” of the oil by showing the quantitative presence of each chemical compound.

Hazard, External Explosion – An external explosion hazard exists when the Analyzer House is erected at a location where flammable material can be introduced from the outside, resulting in dangerous concentrations of flammable gases and vapors inside the Analyzer House.

Hazard, Internal Explosion – An internal explosion hazard exists when a flammable mixture can result from the leakage of samples or auxiliary supplies inside the Analyzer House.

Hazardous Area – Area in which an explosive gas atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation, and use of the analyzers (includes Zones 0, 1, and 2 – Division 1 and 2 are also utilized as hazardous area definitions in many regions – refer to appropriate authorities and standards for detail definitions).

Heat Rate – The amount of fuel energy required by a power plant to produce one kilowatt-hour of electrical output. A measure of generating station thermal efficiency, generally expressed in BTU per net kWh.

Hysteresis – The difference in indicated values when the same value of the property being measured is applied but preceded by a lower then a higher value.

Ignition Temperature (T-rating) – Lowest temperature of a heated surface at which, under specified conditions, the ignition of a flammable substance in the form of a gas or vapor mixture with air will occur.

Influence Quantity – Any quantity, which is not the subject of the measurement, but which influences the indication of the measuring equipment.

Intercept – The estimated y value corresponding to $x = 0$.

Interference Error – The error caused by substances other than those affecting the measured property being present in the sample.

Intrinsic Error – The error when used under reference conditions.

ISA-SP100 – The Wireless Systems for Automation committee of ISA that will establish standards, recommended practices, technical reports, and related information that will define procedures for implementing wireless systems in the automation control environment.

Lack-of-fit – A statistical technique when replicate data are available; computes the significance of residual means to replicate y variability, to indicate if a model is adequate; compares the amount of residual variation *at* each concentration with the amount of residual variation *between* concentrations.

Lack-of-fit Error – Error due to possible inadequacy of a model; total error minus pure error.

Lag Time – The sum of the ‘sampling system lag’ and the ‘analyzer response time’, i.e. the time between withdrawal of sample from the process and the analysis result.

Limit of Detection – The limit of detection (LOD) is the lowest concentration of an analyte in a sample that can be detected, not quantitated. It is a limit test that specifies whether an analyte is above or below a certain value.

Limit of Quantitation – The limit of quantitation (LOQ) is the lowest concentration of an analyte in a sample that can be determined (quantitated) with acceptable precision and accuracy under the stated operational conditions of the method.

Limits of Error – The maximum values of error assigned by the manufacturer to the indicated values of an analyzer operating under specified conditions.

Linearity – The ability of the method to elicit test results that are directly, or by a well-defined mathematical transformation, proportional to analyte concentration within a given range.

Linearity Error – The maximum deviation between indicated values and a linear function of indicated value versus the true value of the property being measured, which includes indicated values near the upper and lower limits of the rated range.

Lower Explosive Limit – Volume ratio of the flammable gas or vapor in air below which an explosive gas atmosphere will not be formed.

Lower Flammable Limit – Volume ratio of the flammable gas or vapor in air below which an explosive gas atmosphere will not be formed.

Measurement – A raw or reported value intended to represent a physical quantity or quality.

Mesh Networking – A way to route data, voice, and instructions between nodes. It allows for continuous connections and reconfiguration around blocked paths by “hopping” from node to node until a connection establishes itself.

Minimum Detectable Change – The change in value of the property to be measured equivalent to twice the output fluctuation.

Model – Mathematical expression (e.g., straight line, quadratic) relating y to some function of x .

Monitor – Provides a quantitative measurement, not qualitative. It measures continuously a condition that must be kept within prescribed limits. It does not differentiate between compounds.

Multi-Stream System – A system comprising one analyzer shared between two or more sample streams.

Near Nonattainment Area – A geographic area that meets National Ambient Air Quality Standards but only by a slim margin is known as a near nonattainment area. This term is most often applied to areas that comply with the 1-hour ozone standard but fail to meet the new – but currently unenforceable – 8-hour ozone standard.

Neural Network – A type of statistical computer program, which classifies large and complex data sets by grouping cases together in a way similar to the human brain.

Noise – Time varying (i.e., “stochastic”) error.

Non-Hazardous Area – Area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation, and use of the analyzers.

Nonattainment Area – A geographic area that fails to meet a National Ambient Air Quality Standard is called a “nonattainment area”. An area must be officially designated by the Environmental Protection Agency, under procedures set forth by the Federal Clean Air Act, in order to be classified in nonattainment. An area that complies with a National Ambient Air Quality Standard is generally known as an “attainment area”, although this is not an official classification under the Federal Clean Air Act.

Normal/Gaussian Distribution – The “bell curve”, frequency proportional to $\exp(-x^2)$

NO_x – Gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules. A by-product of combustion processes, especially at high temperatures. Contribute to acid rain, are harmful to plants, act as a respiratory irritant, and contribute to the formation of ozone.

Null Hypothesis – The starting hypothesis for a statistical test; usually, the hypothesis that the investigator is attempting to disprove, at a specified level of confidence (note that lack of rejection does *not* prove the null hypothesis).

Offsets/Pollutions Offsets/Industrial Growth Offset – Offsets are the reduction of current emissions at a rate equal to or greater than the amount of emissions expected to be produced in a new project. The offset ratio is determined by the severity of the ozone problem in a particular area.

Omnidirectional Antennas – Radiate and receive equally well in all horizontal directions. The gain of an omnidirectional antenna can increase by narrowing the beam width in the vertical or elevation plane. The net effect is to focus the antenna’s energy toward the horizon.

Ordinary Least Squares – Computes model coefficients to minimize the sum of squared residuals.

Output Fluctuation – The peak-to-peak deviations of the output measured with constant input and constant influence quantities.

Oxidation – The increase in oxygen content of a molecule. If an element combines with oxygen, it is said to be oxidized.

p-value – The statistical significance of a test; the probability value associated with a statistical test, representing the likelihood that a test statistic would assume or exceed a certain value purely by chance, assuming the starting hypothesis is true (a low p-value indicates statistical significance at a level of confidence equal to 1.0 minus the p-value).

Parameter Estimate – A computed value for a model coefficient, such as a slope or intercept.

Perceptron – A computational model of a biological neuron comprising some input channels, a processing element, and a single output. Each input value is multiplied by a channel weight, summed by the processor, passed through a nonlinear filter, and put into the output channel.

Performance Characteristic – One of the quantities assigned to an apparatus in order to define by values, tolerances, ranges, etc., its performance.

pH – The degree of acidity or alkalinity measured on a scale from 0 to 14 with 7 the neutral point. Measurement of pH is important to quality control in any number of industries. From 0 to 7 is acidic, and from 7 to 14 is alkaline. Battery acid is about pH 1, lye is 13 pH, and ammonia is about 12 pH.

PID Control – A common form of single-loop controller, which can handle many situations encountered in control. PID refers to a three-term control mechanism combining proportional, integral, and derivative control actions.

Piezo Resistance – The property whereby the electrical resistance of a metal changes with the stress or weight applied to that piece of metal.

Precision – Precision is the measurement of agreement among individual test results when an analytical method is used repeatedly for multiple samplings of a homogeneous sample. Quantified by standard deviation, relative standard deviation, or coefficient of variation.

Prediction Interval – A confidence limit for the “next” observation from a population, or the “next” value obtained from a regression line, as in inverse prediction with a calibration line (while prediction limits apply at the stated level of confidence only to a single, future observation, they can collectively apply to many future observations, and will, on average, achieve the same confidence level).

Process Lag – The time between control action and the resulting change at the process analyzer sample point.

Propagate – To spread from one place to another.

Pure Error – Random error; error inherent in the data; exists no matter what model is fitted to the data (or if not model is fitted); $\sum [(y_i) - (y_{\text{mean}})]^2$.

Qualification – Before undertaking the task of method validation, the analytical system itself must be validated or qualified. Qualification is a subset of the validation process that verifies

module and system performance before an instrument is placed on-line. If the instrument is not qualified before use, and users encounter a problem, the source of the problem will be difficult to identify. Methods cannot be validated on a system that has not been qualified.

Quantitation Limit – Concentration below which numerical measurement values cannot be reported reliably.

Radial Basis Function Network – A type of artificial neural network for application to problems of supervised learning.

Range – The interval between the upper and lower levels of analyte (inclusive) that have been demonstrated to be determined with precision, accuracy, and linearity using the method as written.

Rated Operating Conditions – A set of operating ranges for influence quantities and associated ranges of performance characteristics within which the variations of an instrument are specified by the manufacturer.

Rated Value – A value assigned to a performance characteristic of the analyzer by the manufacturer.

Recovery Curve – A curve (usually assumed to be a straight line) that relates the average measurement to the known true concentration. Typically, the recovery-curve slope is not the ideal of 1 and the intercept is not the ideal of (0,0).

Reference Conditions – The appropriate set of influence quantities, with reference values with their tolerances and reference ranges, with respect to which intrinsic error is specified.

Reference Range – A specified range of values of one of a set of reference conditions.

Reference Value – A specified value of one of a set of reference conditions.

Regression – An analysis technique for fitting a model to data; often used as a synonym for ordinary least squares.

Relative Error – The ration of the error to the conventionally true value (when expressed in the same units).

Relative Standard Deviation – A measurement of precision; = standard deviation of measured values divided by the mean or true measurement; often expressed as a %.

Repeatability – The spread of the results of successive measurements at short intervals of time of identical test material, carried out by the same method, with the same measuring instruments, by the same observer, in the same laboratory, in unchanged environmental conditions and with no adjustments made by external means to the analyzer under test.

Reproducibility – The determination of the spread around the true value. Determined by multiple measurements of the same samples at multiple sites, it is the true error of the method.

Reproducibility Conditions – Conditions under which test results are obtained with the same test method on identical material in different laboratories.

Residual – Error in the fit; response minus fit.

Resolution – The smallest difference that can be observed consistently between two measurements.

Response Time – For continuous analyzers, the time taken to reach 95% of a step change at the analyzer inlet, i.e. 3 time constants. For cyclic analyzers, the time taken to complete each cycle.

Response Time 90% – The time interval from the instant a step change occurs in the value of the property being measured to the instant when the change in the indicated value passes (and remains beyond) 90% of its steady-state amplitude difference, that is, $T_{90} = T_{10} + T_r$ (or T_f). In cases where the rising and falling response times differ, the different response times should be specified.

Rise (Fall) Time (T_r , T_f) – The difference between the 90% response time and delay time.

Robustness – Robustness is the capacity of a method to remain unaffected by small, deliberate variations in method parameters; it is a measurement of the reliability of a method.

Root Mean Square Error – An estimate of the measurement standard deviation (i.e., inherent variation in the measurement system).

Ruggedness – Ruggedness is the degree of reproducibility of the results obtained under a variety of conditions. These conditions typically include, but are not limited to, different laboratories, analysis, instruments, reagents, and days.

Safety Back-up – Additional personnel, in constant contact with a person or persons in dangerous working conditions, who can assist or provide additional help.

Sample Conditioning Room – A room that is separated from the Analyzer House, containing modules for sample conditioning, auxiliary material, or sample disposal equipment.

Sample Point – The position from which a sample is taken from the source fluid.

Sample Probe – A device inserted into the line for extracting a sample for use with an analyzer.

Sample Recovery System – A system used to return low pressure product by mechanical means back to the process.

Sampling System Lag – The time between withdrawal of sample from the process and its delivery to the analyzer.

Sensor – That part of the analyzer (which may be a separate unit), which is in contact with the medium in which the property is to be measured. Converts a gas or vapor concentration to an electrical signal output. A type of “transducer”.

Six Sigma – A method or set of techniques that has also become a movement focused on business process improvement.

Simulator – A device which provides well-defined electrical properties similar to a specific type of sensor.

Slag – A residue produced by the combustion of coal. This heat-fused material accumulates on the sides and bottom of a boiler, and must be disposed of periodically according to environment regulations.

Slope – The change in y due to a change in x (“rise over run”); constant for a straight line relationship, but can vary otherwise.

Solvent – The substance doing the dissolving, or present as the major component, in the formation of a solution.

Span – The difference between the upper and lower limits of the rated measuring range.

Span Shift – Any change in slope of the input-output curve.

Specified Measuring Range – The set of values of the property to be measured for which the error of the instrument is intended to lie within specified limits.

Specified Operating Range – A range of values of a single influence quantity which forms part of the rated operating conditions.

Specificity – Specificity is the ability to measure the analyte of interest accurately and specifically in the presence of other components that could be expected to be present in the sample matrix. It is a measurement of the degree of interference from things such as other active ingredients, excipients, impurities, and degradation products.

Spontaneous Ignition Temperature – The minimum temperature to which a hydrocarbon must be heated to promote an ignition, in the presence of air, without the application of flame or spark.

Standard Deviation – For n observations, the square root of: the sum of squared deviations from the mean, divided by $(n-1)$.

Standard Error – The estimated standard deviation associated with a particular parameter estimate.

Statistical Confidence Level – The nominal certainty that simple random behavior could not explain a measured difference or comparison.

Statistical Significance – The likelihood that a measured or observed result came about due to simple random behavior.

Statistical Tolerance Interval – An interval that quantifies the uncertainty in a chosen percentage of “ m ” future measurements (“ m ” may be infinite).

Storage Conditions – The extreme conditions which a non-operating instrument can withstand without resulting in damage or degradation of performance when it is afterwards operated under rated operating conditions.

Superheat – Reheating of steam generated by a boiler to increase thermal energy.

System Suitability – System suitability is the checking of a system to ensure system performance before or during the analysis of unknowns. System suitability tests are an integral part of chromatographic methods, and they are used to verify that the resolution and reproducibility of

the system are adequate for the analysis to be performed. System suitability tests are based upon the concept that the equipment, electronics, analytical operations, and samples constitute an integral system that can be evaluated as a whole. System suitability parameters are established as a direct result of ruggedness and robustness studies.

Test Solution – A solution of approximately known value of the property being measured, which is stable in value over an extended period of time.

Toxic Material – Material that is a health hazard by inhalation, skin absorption, or ingestion from the surrounding atmosphere.

Transducer Electronic Data Sheet – Contains information needed by a measurement instrument to interface and properly use the signal from an analog sensor. The definition of Transducer Electronic Data Sheet emanates from the IEEE 1451.2 and IEEE 1451.4.

Transport Conditions – The extreme conditions which a non-operating instrument can withstand without resulting in damage or degradation of performance when it is afterwards operated under rated operating conditions.

True Value – The value of a quantity which is defined with no uncertainty.

Ultra-Wide Band Technology – Refers to a radio communications technique based on transmitting very short duration pulses, often of only nanoseconds or less, whereby the occupied bandwidth goes to very large values.

Uncertainty (of a measurement) – The lack of exactness in measurement (e.g., due to sampling error, measurement variation, and model inexactness); a statistical interval within which the measurement error is believed to occur, at some level of confidence.

Uncertainty Intervals – A range of values for an unknown quantity, representing what is plausible at some confidence level.

Upper Flammable Limit – The concentration at which vapors or gases in air are so rich that not enough air remains to support combustion. Sometimes referred to as UEL (upper explosive limit).

Vapor and Vapor Pressure – Used to distinguish a substance in the gaseous state, but below its boiling point temperature. If a pure liquid partly filling a closed container is allowed to stand, the space above it becomes filled with the vapor of the liquid, which develops a pressure. This vapor pressure increases up to a certain limit, depending on the temperature, where it becomes constant, and the space is then said to be saturated.

Vapor Density – The weight of a volume of pure gas/vapor compared with an equal volume of dry air at the same temperature and pressure. A gas/vapor with a vapor density greater than one may travel at low levels to find a source of ignition. With a vapor density less than one, the gas/vapor tends to rise. Air currents, temperature gradients and other ambient conditions can affect gas/vapor diffusion characteristics, often more than vapor density.

Variability – The characteristic of a product or process in which parameters fluctuate to a significant degree but do not typically trend in a specific direction. Reduction of variability is a priority in systems that attempt to ensure consistent quality and reduce lead times.

Variance (of responses) – The square of the standard deviation.

Variation – The difference between the values indicated by an analyzer for the same value of the property being measured, when a single influence quantity assumes successively two different values.

Volatile Organic Compound – Can be segmented into for chemical families: hydrocarbons, halo hydrocarbons, nitrogen compounds, and oxygen compounds.

Weight – A continuous-scale emphasis or de-emphasis that can be put on an observation for fitting purposes; noisy observations are weighted downwards, whole precise data are weighted upwards.

Wobbe Index – The main indicator of the interchangeability of fuel gases. Industry uses it to compare the combustion energy output of different composition fuel gases in an appliance.

Zero Error – The reading displayed when you know the true reading should be exactly zero.

Zone 0 – Area in which an explosive gas atmosphere is present continuously or for long periods.

Zone 1 – Area in which an explosive gas atmosphere is likely to occur in normal operation.

Zone 2 – Area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only.

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