

GLOSSARY

Process control glossary for calibration professionals

Working in a process control environment such as pharmaceutical, petroleum or gaseous environments can be dangerous, difficult work. Maintaining, building and calibrating these systems takes special expertise and Fluke is prepared with not only the tools, but the information you need to keep your world up and running. This glossary contains common pressure, temperature and loop calibration terms used in process environments.

Pressure calibration terms

Absolute pressure

Absolute pressure measurements are referenced to zero pressure, (a perfect vacuum.)

Absolute pressure transducer

A transducer that has an internal reference chamber sealed at or close to zero pressure (full vacuum) when exposed to atmosphere a reading of approximately 14.7 psi results.

Boyle's law

The volume of a gas is inversely proportional to the pressure of the gas at constant temperature: $V=1/P$.

Charles' law

Essentially states for a fixed volume of gas, if the temperature is raised, the pressure will increase. $P=\text{Constant} \times T$.

Common mode pressure

The underlying common pressure (or static pressure) within a system from which a differential measurement is being made.

D/P: Differential pressure, (pronounced DP)

Other names used to mean the same thing are d/p cell, d/p transmitter and DP transmitter (where D is delta or differential). This is the most common type of transmitter used in most process industries. It can be used to measure level, flow, pressure,

differential pressure, and density or specific gravity. With some modifications, it can measure such things as temperature and oxygen purity. The d/p transmitter can be pneumatic, electromechanical, or solid state. It can also be a smart transmitter. A typical large process plant can have hundreds or thousands of d/p transmitters in service.

Gage pressure

The pressure relative to atmospheric pressure. Gage pressure=absolute pressure minus one atmosphere.

Gage pressure transducer

A transducer that measures pressure relative to atmospheric pressure.

Ideal gas law

Combining Boyle's law and Charles' law, results in the ideal gas law: $PV=nRT$, where nR is constant for a particular gas analogous to the number of molecules and the relative size of the molecule.

I/P (I to P)

A current to pressure transmitter. A common instrument in modern industrial plants. A typical large paper mill or refinery could have 5,000 I/Ps in use.

Line pressure

The maximum pressure in the pressure vessel or pipe for differential pressure measurement.



Orifice plate

A very low cost and common primary sensing element (PSE) for measuring flow. It must be used in conjunction with a d/p cell. It creates a difference in pressure whose square root is proportional to flow.

P/I (P to I)

A pressure to current transducer.

Pneumatic relay

Refers to a pneumatic instrument that responds to a pressure on its input and switch closure or opening as the pressure reaches its set and reset points output (Example: pressure switch or controller).

PSI

Pounds per square inch (same as psig).

PSIA

Pounds per square inch absolute.

PSID

Pounds per square inch differential.

PSIG

Pounds per square inch gage (same as psi).

Square roote extractor

An instrument or software program that takes the square root of input and puts the result on its output. Square root extraction is needed to linearize many flow signals. Example: orifice plates, venturis, target flow meters, and pitot tubes all require the transmitter's output signal to be linearized. Mag flow meters, turbine flow meters, Doppler flow meters, and vortex shedding flow meters don't require square root extraction.

Static pressure

The zero-velocity pressure at any arbitrary point within a system.

Wet/dry differential

A differential pressure transducer or transmitter that uses a metal diaphragm at the wet port where fluids can be applied, and no diaphragm at the dry port. The dry port exposes the sensor material to the medium, so only clean dry gas can be applied to this port.

Wetted parts

The diaphragm and pressure port material that comes in direct contact with the medium (gas, liquid).

Temperature calibration terms

Dry well calibrator

A temperature calibrator that uses a precision oven to source precise temperature. This style of calibrator is often used for the verification of temperature sensors.

Excitation current

A constant current applied to an RTD probe to determine actual resistance for temperature measurement. Typical values are 2 mA or less to minimize self-heating of the probe.

IPTS-68

International Practical Temperature Scale of 1968. A temperature standard adopted in 1968 that uses intrinsic standards to define the measurement of temperature.

ITS-90

International Temperature Scale of 1990. A temperature standard adopted in 1990 that uses intrinsic standards to define the measurement of temperature. This standard modifies the intrinsic standards of IPTS-68 with additional intrinsic references.

Lead resistance compensation

A compensation method used with 3 and 4 wire RTDs and resistance measurement. This method negates the error associated with lead resistance when making an RTD measurement.

Reference temperature

The temperature at which a thermocouple temperature measurement is referenced. For Fluke Calibration tools, this is the temperature where the thermocouple mini-plug is connected to the calibrator.

R ϕ

The resistance value of an RTD probe at 0 °C. Example PT100-385, R ϕ =100 Ω .

RTD

Resistance Temperature Device, a temperature measurement sensor that has predictable changes in resistance with a change in temperature. The most common RTD is the platinum PT100-385.

Seebeck effect

Thermoelectric effect in which the voltage potential increases with temperature (thermocouples) in a junction of dissimilar metals.

Triple point of water

This temperature reference point is the intrinsic standard at which water is liquid, ice and gas. This reference point defines 0.01 °C.

Loop calibration terms

4-20 mA Loop

A 4-20 mA signal that is representative of a process variable or a control signal that controls a process variable.

Compliance voltage

The voltage a current source develops when attempting to drive a mA signal through a resistive load.

DMM

Digital multimeter.

Electronic valve positioners

Devices that can control the flow in a process with input from a mA or digital control signal.

Ground loop

A difference in potential (voltage) between (2) signal grounds.

Linearity

The closeness of a calibration curve to a specified straight line. Linearity is expressed as the maximum deviation of any calibration point from a specified straight line.

Loop-powered isolator

A device that produces an electrically isolated mirror image of the input side 4-20 mA current.

mA

Milliamp; a unit of electric current equal to one thousandth of an ampere.

Precision current shunt

A conductor joining two points in a circuit to form a parallel circuit, through which a precision voltage can be measured or derived.

RTD

Resistance temperature device, a temperature measurement sensor that has predictable changes in resistance with a change in temperature.

Signal conditioner

A circuit to modulate a signal so as to make it intelligible to, or compatible with, another device, including such manipulation as pulse shaping, pulse clipping, compensating, digitizing, and linearizing.

Strain gauge

A measuring element for converting force, pressure, tension, etc., into an electrical signal.

Thermocouple

A junction of dissimilar metals that generates a small voltage correlated to the temperature of the junction (see Seebeck Effect).

µA or uA

Microamp; a unit of electric current equal to one millionth of an ampere.

Vernier

A small, movable, graduated scale running parallel to the fixed graduated scale and used for measuring a fractional part of one of the divisions of the fixed scale.



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