| Thermocouple Types (ANSI Symbol) | Materials |
|---|---|
| J | Iron/Constantan |
| K | Chromel/Alumel |
| T | Copper/Constantan |
| E | Chromel/Constantan |
| R | Platinum/Platinum 13% Rhodium |
| S | Platinum/Platinum 10% Rhodium |
| B | Platinum 6% Rhodium/Platinum 30% Rhodium |
| G* | Tungsten/Tungsten 26% Rhenium |
| C* | Tungsten 5% Rhenium/Tungsten 26% Rhenium |
| D* | Tungsten 3% Rhenium/Tungsten 25% Rhenium |

*Not ANSI symbols

**Thermopile:** An arrangement of thermocouples in series such that alternate junctions are at the measuring temperature and the reference temperature. This arrangement amplifies the thermoelectric voltage. Thermopiles are usually used as infrared detectors in radiation pyrometry.
**Thermowell:** A closed-end tube designed to protect temperature sensors from harsh environments, high pressure, and flows. A thermowell can be installed into a system by pipe thread or welded flange and is usually made of corrosion-resistant metal or ceramic material, depending upon the application.
**Thomson Effect:** When current flows through a conductor within a thermal gradient, a reversible absorption or evolution of heat will occur in the conductor at the gradient boundaries.
**Transducer:** A device (or medium) that converts energy from one form to another. The term is generally applied to devices that take a physical phenomenon (pressure, temperature, humidity, flow, etc.) and convert it to an electrical signal.
**Transient Vibration:** A temporary vibration or movement of a mechanical system.
**Transitional Flow:** Flow between laminar and turbulent flow, usually between pipe Reynolds numbers of 2000 and 4000.
**Transmitter:** A device which translates the low level output of a sensor or transducer to a high level signal suitable for transmission to a site where it can be further processed.
**Transmitter (Two-Wire):** A device which is used to transmit temperature data from either a thermocouple or RTD via a two-wire current loop. The loop has an external power supply and the transmitter acts as a variable resistor with respect to its input signal.
**Triac:** A solid state switching device used to switch alternating current wave forms.
**Triboelectric Noise:** The generation of electrical charges caused by layers of cable insulation. This is especially troublesome in high impedance accelerometers.
**Triple Point:** The temperature and pressure at which solid, liquid, and gas phases of a given substance are all present simultaneously in varying amounts.
**Triple Point (Water):** The thermodynamic state where all three phases, solid, liquid, and gas, may all be present in equilibrium. The triple point of water is .01°C.
**True RMS:** The true root-mean-square value of an ac or ac-plus-dc signal, often used to determine the power of a signal. For a perfect sine wave, the RMS value is 1.11072 times the rectified average value, which is utilized for low-cost metering. For significantly non-sinusoidal signals, a true RMS converter is required.
**TTL:** Transistor-to-transistor logic. A form of solid state logic which uses only transistors to form the logic gates.
**TTL-Compatible:** For digital input circuits, a logic 1 is obtained for inputs of 2.0 to 5.5 V which can source 40 mA, and a logic 0 is obtained for inputs of 0 to 0.8 V which can sink 1.6 mA. For digital output signals, a logic 1 is represented by 2.4 to 5.5 V with a current source capability of at least 400 mA; and a logic 0 is represented by 0 to 0.6 V with a current sink capability of at least 16 mA.
**TTL Unit Load:** A load with TTL voltage levels, which will draw 40 mA for a logic 1 and -1.6 mA for a logic 0.
**Turbulent Flow:** The type of flow that occurs when forces due to inertia are more significant than forces due to viscosity. This typically occurs with a Reynolds number in excess of 4000.
**Typical Error:** Error within plus or minus one standard deviation (±1%) of the nominal specified value, as computed from the total population.

## U

**UL:** Underwriters Laboratories, Inc. An independent laboratory that establishes standards for commercial and industrial products.
**Ultraviolet:** That portion of the electromagnetic spectrum below blue light (380 nanometers).
**Unbalance:** That condition which exists in a rotor when vibratory force or motion is imparted to its bearings as a result of centrifugal forces.
**Unbalance Tolerance:** The unbalance tolerance with respect to a radial plane (measuring plane or correction plane) is that amount of unbalance which is specified as the maximum below which the state of unbalance is considered acceptable.
**Undershoot:** The difference in temperature between the temperature a process goes to below the setpoint after the cooling cycle is turned off, and the setpoint temperature.
**Ungrounded Junction:** A thermocouple probe in which the hot or measuring junction is fully enclosed by and insulated from the sheath material.
**Union:** A pipe fitting where two extension pipes are joined at a separable coupling.

## V

**Vacuum:** Any pressure less than atmospheric pressure.
**Velocity:** The time rate of change of displacement: dx/dt.
**Vibration Error:** The maximum change in the output of a transducer when a specified amplitude and range of frequencies are applied to a specific axis at room temperature.
**Vibration Error Band:** The error recorded in the output of a transducer when subjected to a given set of amplitudes and frequencies.
**Vibration Transducer:** Generally, any device which converts movement, either shock or steady state vibration, into an electrical signal proportional to the movement; a sensor.
**Viscosity:** The inherent resistance of a substance to flow.
**Volt:** The (electrical) potential difference between two points in a circuit. The fundamental unit is defined as work per unit charge (V=W/Q). One volt is the potential difference required to move one coulomb of charge between two points in a circuit while using one joule of energy.
**Voltage:** An electrical potential which can be measured in volts.
**Voltmeter:** An instrument used to measure voltage.
**Volumetric Flow Rate:** Calculated using the area of the full closed conduit and the average fluid velocity in the form, $Q = \bar{v}A$, to arrive at the total volume quantity of flow. Q = volumetric flowrate, $\bar{v}$ = average fluid velocity, and A = cross-sectional area of the pipe.

## W

**Watt Density:** The watts emanating from each square inch of the heated surface area of a heater. Expressed in units of watts per square inch.
**Wheatstone Bridge:** A network of four resistances, an emf source, and a galvanometer connected such that, when the four resistances are matched, the galvanometer will show a zero deflection or "null" reading.
**Window:** In computer graphics, a defined area in a system not bounded by any limits; unlimited "space" in graphics.
**Word:** Number of bits treated as a single unit by a CPU. In an 8-bit machine, the word length is 8 bits; in a sixteen-bit machine, it is 16 bits.
**Working Standard:** A standard of unit measurement calibrated from either a primary or secondary standard which is used to calibrate other devices or make comparison measurements.
**Write:** To record data in a storage device or on a data medium.

## Y

**Young's Modulus:** Also known as Modulus of Elasticity; equivalent to the ratio of normal stress to strain.

## Z

**Zero Adjustment:** The ability to adjust the display of a process or strain meter so that zero on the display corresponds to a non-zero signal, such as 4 mA, 10 mA, or 1 Vdc. The adjustment range is normally expressed in counts.
**Zero Offset:** 1) The difference, expressed in degrees, between true zero and an indication given by a measuring instrument. 2) See "Zero Suppression."
**Zero Point pH Meters:** The electrical zero point where zero millivolts would be displayed. Used in conjunction with the slope control to provide a narrower range calibration.
**Zero Point Electrode** See "Isopotential Point."
**Zero Power Resistance:** The resistance of a thermistor or RTD element with no power being dissipated.
**Zero Suppression:** The span of an indicator or chart recorder may be offset from zero (zero suppressed) such that neither limit of the span will be zero. For example, a temperature recorder which records a 100° span from 400° to 500° is said to have 400° zero suppression.
**Zero Voltage Switching:** The making or breaking of a circuit timed such that the transition occurs when the voltage wave form crosses zero voltage; typically found only in solid state switching devices.
**Zooming:** In computer graphics, causing an object to appear smaller or larger by moving the window and specifying various window sizes.