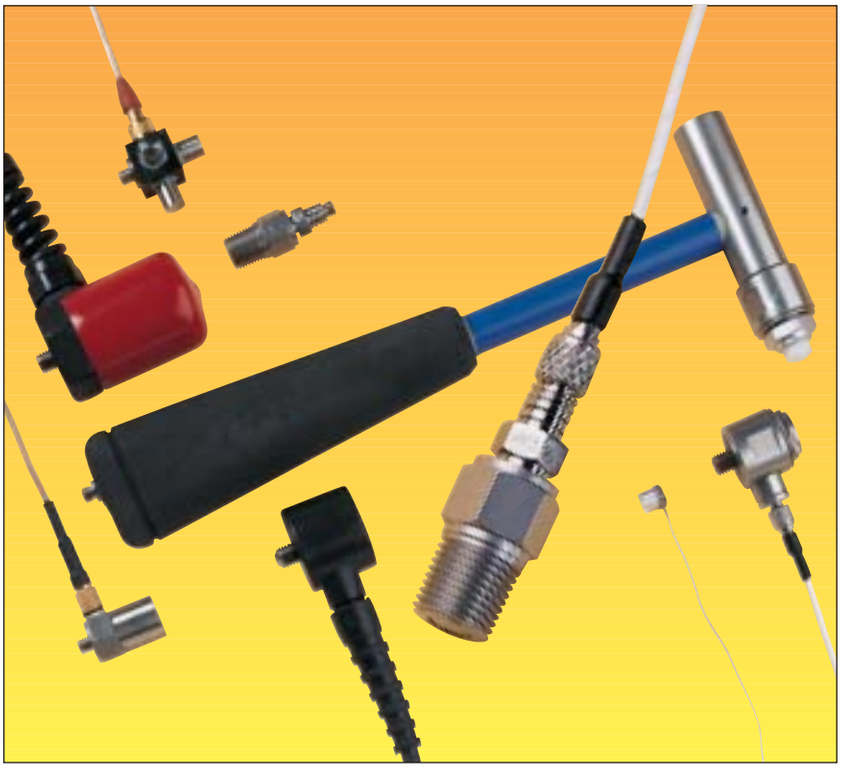

required for platinum alloy thermocouples. Ceramic insulators are available as single and multihole tubes or as beads.

Ceramic: Polycrystalline ferroelectric materials which are used as the sensing units in piezoelectric accelerometers. There are many different grades, all of which can be made in various configurations to satisfy different design requirements.

CFM: The volumetric flow rate of a liquid or gas in cubic feet per minute.

Character: a letter, digit or other symbol that is used as the representation of data. A connected sequence of characters is called a character string.

Charge Sensitivity: For accelerometers that are rated in terms of charge sensitivity, the output voltage (V) is proportional to the charge (Q) divided by the shunt capacitance (C). This type of accelerometer is characterized by a high output impedance. The sensitivity is given in terms of charge; picocoulombs per unit of acceleration (g).

Chatter: The rapid cycling on and off of a relay in a control process due to insufficient bandwidth in the controller.

CHROMEGA®: A chromium-nickel alloy which makes up the positive leg of type K and type E thermocouples (registered trademarks of OMEGA ENGINEERING, INC.).

Clock: The device that generates periodic signals for synchronization.

CMR (Common-Mode Rejection): The ability of a panel meter to eliminate the effect of AC or DC noise between signal and ground. Normally expressed in dB at dc to 60 Hz. One type of CMR is specified between SIG LO and PWR GND. In differential meters, a second type of CMR is specified between SIG LO and ANA GND (METER GND).

CMV (Common-Mode Voltage): The AC or DC voltage which is tolerable between signal and ground. One type of CMV is specified between SIG LO and PWR GND. In differential meters, a second type of CMV is specified between SIG HI or LO and ANA GND (METER GND).

Common Mode Rejection Ratio: The ability of an instrument to reject interference from a common voltage at its input terminals with relation to ground. Usually expressed in db (decibels).

Common Mode: The output form or type of control action used by a temperature controller to control temperature, i.e. on/off, time proportioning, PID.

Communication: Transmission and reception of data among data processing equipment and related peripherals.

Compensated Connector: A connector made of thermocouple alloys used to connect thermocouple probes and wires.

Compensating Alloys: Alloys used to connect thermocouples to instrumentation. These alloys are selected to have similar thermal electric properties as the thermocouple alloys (however, only over a very limited temperature range).

Compensating Loop: Lead wire resistance compensation for RTD elements where an extra length of wire is run from the instrument to the RTD and back to the instrument, with no connection to the RTD.

Compensation: An addition of specific materials or devices to counteract a known error.

Complex Functions: Usually expressed in terms of both their amplitude and phase.

Complex Wave: The resultant form of a number of sinusoidal waves that are summed together forming a periodic wave. Such waves may be analyzed in the frequency domain to readily determine their component parts.

Conductance: The measure of the ability of a solution to carry an electrical current. (See Equivalent conductance.)

Conduction: The conveying of electrical energy or heat through or by means of a conductor.

Confidence Level: The range (with a specified value of uncertainty, usually expressed in percent) within which the true value of a measured quantity exists.

Connection Head: An enclosure attached to the end of a thermocouple which can be cast iron, aluminum or plastic within which the electrical connections are made.

Constantan: A copper-nickel alloy used as the negative lead in Type E, Type J, and Type T thermocouples.

Control Mode: The output form or type of control action used by a temperature controller to control temperature, i.e., on/off, time proportioning, PID.

Control Point: The temperature at which a system is to be maintained.

Convection: 1. The circulatory motion that occurs in a fluid at a non-uniform temperature owing to the variation of its density and the action of gravity. 2. The transfer of heat by this automatic circulation of fluid.

Coriolis Force: A result of centripetal force on a mass moving with a velocity radially outward in a rotating plane.

Coulomb Sensitivity: Charge/unit acceleration, expressed in Pc/g (charge sensitivity).

Coulomb: A measurement of the quantity of electrical charge, usually expressed as pico coulomb (10^{-12} coulombs).

Counter Weight: A weight added to a body so as to reduce a calculated unbalance at a desired place.

Counts: The number of time intervals counted by the dual-slope A/D converter and displayed as the reading of the panel meter, before addition of the decimal point.

CPS: Cycles per second; the rate or number of periodic events in one second, expressed in Hertz (Hz).

CPU: Central processing unit. The part of the computer that contains the circuits that control and perform the execution of computer instructions.

Critical Damping: Critical damping is the smallest amount of damping at which a given system is able to respond to a step function without overshoot.

Critical Speed: The rotational speed of the rotor or rotating element at which resonance occurs in the system. The shaft speed at which at least one of the "critical" or natural frequencies of a shaft is excited.

Cryogenics: Measurement of temperature at extremely low values, i.e., below –200°C.

CSA: Canadian Standards Administration.

Current Proportioning: An output form of a temperature controller which provides a current proportional to the amount of control required. Normally is a 4 to 20 milliamp current proportioning band.

Current: The rate of flow of electricity. The unit if the ampere (a) defined as 1 ampere = 1 coulomb per second.

Cycle Time: The time usually expressed in seconds for a controller to complete one on/off cycle.

– D –

Damping: The reduction of vibratory movement through dissipation of energy. Types include viscous, coulomb, and solid.

Data Base: A large amount of data stored in a well-organized manner. A data base management system (DBMS) is a program that allows access to the information.

dB (Decibel): 20 times the log to the base 10 of the ratio of two voltages. Every 20 dB's correspond to a voltage ratio of 10, every 10 dB's to a voltage ratio of 3.162. For instance, a CMR of 120 dB provides

voltage noise rejection of 1,000,000/1. An NMR of 70 dB provides voltage noise rejection of 3,162/1.

DC: Direct current; an electric current flowing in one direction only and substantially constant in value.

Dead Band: 1. For chart records: the minimum change of input signal required to cause a deflection in the pen position. 2. For temperature controllers: the temperature band where heat is turned off upon rising temperature and turned on upon falling temperature expressed in degrees. The area where no heating (or cooling) takes place.

Dead Volume: The volume of the pressure port of a transducer at room temperature and ambient barometric pressure.

Debug: To find and correct mistakes in a program.

Decimal: Refers to a base ten number system using the characters 0 through 9 to represent values.

Default: The value(s) or option(s) that are assumed during operation when not specified.

Degree: An incremental value in the temperature scale, i.e., there are 100 degrees between the ice point and the boiling point of water in the Celsius scale and 180°F between the same two points in the Fahrenheit scale.

Density: Mass per unit of volume of a substance. I.E.: grams/cu.cm. or pounds/cu.ft.

Deviation: The difference between the value of the controlled variable and the value at which it is being controlled.

Diaphragm: The sensing element consisting of a membrane which is deformed by the pressure differential applied across it.

Dielectric Constant: Related to the force of attraction between two opposite charges separated by a distance in a uniform medium.

Differential Input: A signal-input circuit where SIG LO and SIG HI are electrically floating with respect to ANALOG GND (METER GND, which is normally tied to DIG GND). This allows the measurement of the voltage difference between two signals tied to the same ground and provides superior common-mode noise rejection.

Differential Pressure: The difference in static pressure between two identical pressure taps at the same elevation located in two different locations in a primary device.

Differential: For an on/off controller, it refers to the temperature difference between the temperature at which the controller turns heat off and the temperature at which the heat is turned back on. It is expressed in degrees.

Digit: A measure of the display span of a panel meter. By convention, a full digit can assume any value from 0 through 9, a ½-digit will display a 1 and overload at 2, a ¾-digit will display digits up to 3 and overload at 4, etc. For example, a meter with a display span of ±3999 counts is said to be a 3¾ digit meter.

Digital Output: An output signal which represents the size of an input in the form of a series of discrete quantities.

Digital-to-Analog Converter (D/A or DAC): A device or circuit to convert a digital value to an analog signal level.

DIN (Deutsche Industrial Norm): A set of German standards recognized throughout the world. The 1/8 DIN standard for panel meters specifies an outer bezel dimension of 96 x 48 mm and a panel cutout of 92 x 45 mm.

Discharge Time Constant: The time required for the output-voltage from a sensor or system to discharge 37% of its original value in response to a zero rise time step function input. This parameter determines a low frequency response.

Disk Operating System (DOS): Program used to control the transfer of information to and from a disk, such as MS DOS.

Displacement: The measured distance traveled by a point from its position at rest. Peak to peak displacement is the total measured movement of a vibrating point between its positive and negative extremes. Measurement units expressed as inches or millimeters.

Drift: A change of a reading or a set point value over long periods due to several factors including change in ambient temperature, time, and line voltage.

Dual Element Sensor: A sensor assembly with two independent sensing elements.

Duplex Wire: A pair of wires insulated from each other and with an outer jacket of insulation around the inner insulated pair.

Duty Cycle: The total time to one on/off cycle. Usually refers to the on/off cycle time of a temperature controller.

Dynamic Calibration: Calibration in which the input varies over a specific length of time and the output is recorded vs. time.

Dynamic Pressure: The difference in pressure levels from static pressure to stagnation pressure caused by an increase in velocity. Dynamic pressure increases by the square of the velocity.

Dynamic Unbalance: Dynamic unbalance is that condition in which the central principal axis is not coincident with the shaft axis.

– E –

Electrical Interference: Electrical noise induced upon the signal wires that obscures the wanted information signal.

EMF: Electromotive force. A rise in (electrical) potential energy. The principal unit is the volt.

EMI: Electromagnetic interference.

Emissivity: The ratio of energy emitted by an object to the energy emitted by a blackbody at the same temperature. The emissivity of an object depends upon its material and surface texture; a polished metal surface can have an emissivity around 0.2 and a piece of wood can have an emissivity around 0.95.

End Points: The end points of a full scale calibration curve.

Endothermic: Absorbs heat. A process is said to be endothermic when it absorbs heat.

Enthalpy: The sum of the internal energy of a body and the product of its volume multiplied by the pressure.

Environmental Conditions: All conditions in which a transducer may be exposed during shipping, storage, handling, and operation.

Eprom: Erasable Programmable Read-Only Memory. The PROM can be erased by ultraviolet light or electricity.

Excitation: The external application of electrical voltage current applied to a transducer for normal operation.

Exothermic: Gives off heat. A process is said to be exothermic when it releases heat.

Expansion Factor: Correction factor for the change in density between two pressure measurement areas in a constricted flow.

Explosion-proof Enclosure: An enclosure that can withstand an explosion of gases within it and prevent the explosion of gases surrounding it due to sparks, flashes or the explosion of the container itself, and maintain an external temperature which will not ignite the surrounding gases.

Exposed Junction: A form of construction of a thermocouple probe where the hot or measuring junction protrudes beyond the sheath material so as to be fully exposed to the medium being measured. This form of construction usually gives the fastest response time.

– F –

Fahrenheit: A temperature scale defined by 32° at the ice point and 212° at the boiling point of water at sea level.

Ferrule: A compressible tubular fitting that is compressed onto a probe inside a compression fitting to form a gas-tight seal.

Floppy Disk: A small, flexible disk carrying a magnetic medium in which digital data is stored for later retrieval and use.

Flow Rate: Actual speed or velocity of fluid movement.

Flow: Travel of liquids or gases in response to a force (i.e. pressure or gravity).

which exhibits a large change in resistance proportional to a small change in temperature. Thermistors usually have negative temperature coefficients.

Thermocouple Type (ANSI Symbol)	Material
J	Iron/Constantan
K	CHROMEGA®/ALOMEGA®
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.

Thermocouple: The junction of two dissimilar metals which has a voltage output proportional to the difference in temperature between the hot junction and the lead wires (cold junction) (refer to Seebeck EMF).

Thermowell: A closed-end tube designed to protect temperature sensors from harsh environments, high pressure, and flows. They can be installed into a system by pipe thread or welded flange and are usually made of corrosion-resistant metal or ceramic material depending upon the application.

Transducer Vibration: Generally, any device which converts movement, either shock or steady state vibration, into an electrical signal proportional to the movement; a sensor.

Transducer: A device (or medium) that converts energy form one from to another. The term is generally applied to devices that take 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 a pipe Reynolds number of 2000 and 4000.

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.

Transmitter: 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.

Transmitter: A device which translates the low level output of a sensor or transducer to a higher level signal suitable for transmission to a site where it can be further processed.

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 (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.

Triple Point: The temperature and pressure at which solid, liquid, and gas phases of a given substance are all present simultaneously in varying amounts.

True RMS: The true root-mean-square value of an AC or AC-plus-DC signal, often used to determine 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 Unit Load: A load with TTL voltage levels, which will draw 40 µA for a logic 1 and –1.6 mA for a logic 0.

TTL-Compatible: For digital input circuits, a logic 1 is obtained for inputs of 2.0 to 5.5 V which can source 40 µA, 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 µA; and a logic 0 is represented by 0 to 0.6 V with a current sink capability of at least 16 mA.

TTL: Transistor-to-transistor logic. A form of solid state logic which uses only transistors to form the logic gates.

Turbulent Flow: 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 is 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.

Undershoot: The difference in temperature between the temperature a process goes to, below the set point, after the cooling cycle is turned off and the set point temperature.

Ungrounded Junction: A form of construction of a thermocouple probe where the hot or measuring junction is fully enclosed by and insulated from the sheath material.

Union: A form of 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 Band: The error recorded in output of a transducer when subjected to a given set of amplitudes and frequencies.

Vibration Error: The maximum change in output of a transducer when a specific amplitude and range of frequencies are applied to a specific axis at room temperature.

Viscosity: The inherent resistance of a substance to flow.

Volt: The (electrical) potential difference between two points in a circuit. The fundamental unit is derived 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.

Volume Flow Rate: Calculated using the area of the full closed conduit and the average fluid velocity in the form, Q = V x A, to arrive at the total volume quantity of flow. Q = volumetric flowrate, V = average fluid velocity, and A = cross sectional area of the pipe.

– W –

Watt Density: The watts emanating from each square inch of 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.

– Y –

Young’s Modulus: Young’s Modulus (the Modulus of Elasticity) is 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 V dc. 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 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.