Chapter 13—Terminology

calibrate, *v.*: 1. *general*—to determine the indication or output of a measuring device with respect to that of a standard.
2. *thermocouple*—to determine the emf developed by a thermocouple with respect to temperature established by a standard.

calibration point, *n.*: 1. *general*—a specific value, established by a standard, at which the indication or output of a measuring device is determined.
2. *thermocouple*—a temperature, established by a standard, at which the emf developed by a thermocouple is determined.

Celsius, *n.*—the designation of the degree on the International Practical Temperature Scale. Also used for the name of the Scale, as "Celsius temperature scale." Formerly (prior to 1948) called "centigrade."

centigrade, *n.*—the designation of the degree on the International Temperature Scale prior to 1948. (See *Celsius.*)

coaxial thermocouple element, *n.*—a thermocouple element consisting of a thermoelement in wire form, within a thermoelement in tube form with the two thermoelements insulated from each other and from the tube except at the measuring junction.

connection head, *n.*—a housing enclosing a terminal block for an electrical temperature-sensing device and usually provided with threaded openings for attachment to a protecting tube and for attachment of conduit.

defining fixed points, *n.*—the reproducible temperatures upon which the International Practical Temperature Scale is based.

degree, *n.*—the unit of a temperature scale. See Celsius, centigrade, Fahrenheit.

electromotive force (emf), *n.*—the electrical potential difference which produces or tends to produce an electric current.

extension wire, *n.*—a pair of wires having such temperature-emf characteristics relative to the thermocouple with which the wires are intended to be used that, when properly connected to the thermocouple, the reference junction is transferred to the other end of the wires.

Fahrenheit, *n.*—the designation of the degree and the temperature scale used commonly in public life and engineering circles in English-speaking countries. Related to the International Practical Temperature Scale by means of the equation

$$t_F = 9/5\, t_c + 32$$

fixed point, *n.*—a reproducible temperature of equilibrium between different phases of a material. (See *defining fixed points* and *secondary reference points.*)

freezing point, *n.*—the fixed point between the solid and liquid phases of a material when approached from the liquid phase under a pressure of 1 standard atm (101325 N/m^2). For a pure material this is also the melting point.

ice point, *n.*—the fixed point between ice and air-saturated water under a pressure of 1 standard atm (101325 N/m^2). This temperature is 0°C on the International Practical Temperature Scale.

International Practical Temperature Scale of 1948 (IPTS-48), *n.*—the temperature scale adopted by the 11th General Conference on Weights and Measures in 1960. Replaced in 1968 by the International Practical Temperature Scale of 1968.

International Practical Temperature Scale of 1968 (IPTS-68), *n.*—the temperature scale, which through adoption by the 13th General Conference on Weights and Measures in 1968, is defined in terms of fixed and reproducible equilibrium temperatures (defining fixed points) to which numerical values have been assigned, and equations establishing the relation

between temperature and the indications of sensing instruments calibrated by means of the values assigned to the defining fixed points.

kelvin, *n.*—the designation of the thermodynamic temperature scale and the interval on this scale. This kelvin scale was defined by the Tenth General Conference on Weights and Measures in 1954 by assigning the temperature of 273.16 K to the triple point of water. Also the interval on the International Practical Kelvin Temperature Scale.

liquid-in-glass thermometer, *n.*—a temperature-measuring instrument whose indications are based on the temperature coefficient of expansion of a liquid relative to that of its containing glass envelope.

lower range-value, *n.*—the lowest quantity that an instrument is adjusted to measure.

measuring junction, *n.*—that junction of a thermocouple which is subjected to the temperature to be measured.

melting point, n.—the fixed point between the solid and liquid phases of a material when approached from the solid phase under a pressure of 1 standard atm (101325 N/m^2). For a pure material this is also the freezing point.

Peltier coefficient, *n.*—the reversible heat which is absorbed or evolved at a thermocouple junction when unit current passes in unit time. Synonymous with *Peltier emf.*

Peltier emf, *n.*—synonymous with *Peltier coefficient.*

platinum 27 (Pt-27), *n.*—the platinum standard to which the National Bureau of Standards referred thermoelectric measurements prior to 1973.

platinum 67 (Pt-67), *n.*—the platinum standard used by the National Bureau of Standards after 1972 as the reference to which thermoelectric measurements are referred.

potentiometer, Group A, *n.*—a laboratory high-precision type potentiometer having limits of error of approximately 0.2 μV at 1000 μV, and 5 μV or less at 50 000 μV.

potentiometer, Group B, *n.*—a laboratory precision type potentiometer having limits of error of approximately 1 μV at 1000 μV and 12 μV or less at 50 000 μV.

primary standard thermocouple, *n.*—a thermocouple that has had its temperature-emf relationship determined in accordance with methods described in the text establishing the International Practical Temperature Scale.

protecting tube, *n.*—a tube designed to enclose a temperature-sensing device and protect it from the deleterious effects of the environment. It may provide for attachment to a connection head but is not primarily designed for pressure-tight attachment to a vessel.

range, *n.*—the region between the limits within which a quantity is measured. It is expressed by stating the lower and upper range-values.

reference junction, *n.*—that junction of a thermocouple which is at a known temperature.

refractory metal thermocouple, *n.*—a thermocouple whose thermoelements have melting points above that of 60 percent platinum-40 percent rhodium, 1935°C (3515°F).

resistance, insulation (sheathed thermocouple wire), *n.*—the measured resistance between wires or between wires and sheath multiplied by the length of the wire expressed in megohms (or ohms) per foot (or meter) of length. (NOTE: The resistance varies inversely with the length.)

secondary reference points, *n.*—reproducible temperatures (other than the *defining fixed points*) listed in the text establishing the International Practical Temperature Scale as being useful for calibration purposes.

secondary standard thermocouple, *n.*—a thermocouple that has had its temperature-emf relationship determined by reference to a primary standard of temperature.

Seebeck coefficient, *n.*—the rate of change of thermal emf with temperature at a given temperature. Normally expressed as emf per unit of temperature. Synonymous with *thermoelectric power.*

Seebeck emf, *n.*—the net emf set up in a thermocouple under condition of zero current. It represents the algebraic sum of the Peltier and Thomson emf. Synonymous with *thermal emf.*

sheathed thermocouple, *n.*—a thermocouple having its thermoelements, and sometimes its measuring junction, embedded in ceramic insulation compacted within a metal protecting tube.

sheathed thermocouple wire, *n.*—one or more pairs of thermoelements (without measuring junctions(s)) embedded in ceramic insulation compacted within a metal protecting tube.

sheathed thermoelement, *n.*—a thermoelement embedded in ceramic insulation compacted within a metal protecting tube.

span, *n.*—the algebraic difference between the upper and lower range-values.

standard platinum resistance thermometer (SPRT), *n.*—a thermometer which meets all the requirements described in the text establishing the International Practical Temperature Scale.

standard thermoelement, *n.*—a thermoelement that has been calibrated with reference to platinum 67 (Pt-67).

test thermocouple, *n.*—a thermocouple that is to have its temperature-emf relationship determined by reference to a temperature standard.

test thermoelement, *n.*—a thermoelement that is to be calibrated with reference to platinum 67 (Pt-67) by comparing its thermal emf with that of a standard thermoelement.

thermal electromotive force (thermal emf), *n.*—the net emf set up in a thermocouple under conditions of zero current. Synonymous with *Seebeck emf.*

thermocouple, *n.*—two dissimilar thermoelements so joined as to produce a thermal emf when the junctions are at different temperatures.

thermocouple assembly, *n.*—an assembly consisting of a thermocouple element and one or more associated parts such as terminal block, connection head, and protecting tube.

thermocouple element, *n.*—a pair of bare or insulated thermoelements joined at one end to form a measuring junction and intended for use as a thermocouple or as part of a thermocouple assembly.

thermocouple, Type E, B, J, K, R, S, or T, *n.*—a thermocouple having an emf-temperature relationship corresponding to the appropriate letter-designated table in ASTM Standard E 230, Temperature-Electromotive Force (EMF) Tables for Thermocouples, within the limits of error specified in that Standard.

thermoelectric power, *n.*—the rate of change of thermal emf with temperature at a given temperature. Synonymous with *Seebeck coefficient.* Normally expressed as emf per unit of temperature.

thermoelectric pyrometer, *n.*—an instrument that senses the output of a thermocouple and converts it to equivalent temperature units.

thermoelement, *n.*—one of the two dissimilar electrical conductors comprising a thermocouple.

thermopile, *n.*—a number of thermocouples connected in series, arranged so that alternate junctions are at the reference temperature and at the measured temperature, to increase the output for a given temperature difference between reference and measuring junctions.

thermowell, *n.*—a closed end reentrant tube designed for the insertion of a temperature-sensing element, and provided with means for pressure-tight attachment to a vessel.

Thomson coefficient, *n.*—the rate at which heat is absorbed or evolved reversibly in a thermoelement, per unit temperature difference per unit current.

Thomson emf, *n.*—the product of the Thomson coefficient and the temperature difference across a thermoelement.

triple point (water), *n.*—the temperature of equilibrium between ice, water, and water vapor. This temperature is +0.01°C on the International Practical Temperature Scale of 1948.

upper range-value, *n.*—the highest quantity that an instrument is adjusted to measure.

working standard thermocouple, *n.*—a thermocouple that has had its temperature-emf relationship determined by reference to a secondary standard of temperature.