

Chapter 13—Definitions

adjusting device (liquid-in-glass thermometer), *n.*—a device to adjust the liquid in the bulb and main capillary to that needed for the intended temperature interval.

bulb (liquid-in-glass thermometer), *n.*—the reservoir for the thermometer liquid.

bulb length (liquid-in-glass thermometer), *n.*—the distance from the bottom of the bulb to the point where the internal bulb diameter begins to decrease as the bulb merges into the stem.

calibrate, *v.*: 1. *general*—to determine the indication or output of a measuring device with respect to that of a standard.

2. *liquid-in-glass thermometer*—to determine the indication of the thermometer with respect to temperature established by a standard.

3. *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. *liquid-in-glass thermometer*—a temperature, established by a standard, at which the indication of the thermometer is determined.

3. *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.

complete immersion thermometer, *n.*—a liquid-in-glass thermometer designed to indicate temperatures correctly when the entire thermometer is exposed to the temperature being measured. (Compare *total immersion thermometer*.)

connecting wire (metal-sheathed heater), *n.*—a conductor used to connect the heater resistance wire to the power supply terminals.

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.

contraction chamber (liquid-in-glass thermometer), *n.*—an enlargement of the bore of the stem which serves to reduce its length, or to prevent contraction of the liquid column into the bulb.

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

degree, *n.*—the unit of a temperature scale.

diameter, (liquid-in-glass thermometer), *n.*—the diameter as measured with a ring gage.

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

expansion chamber (liquid-in-glass thermometer), *n.*—an enlargement at the top of the capillary to provide protection in case of overheating.

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/m²). For a pure material this is also the melting point.

heater, metal sheathed, electrical resistance, *n.*—one consisting of resistance wire or wires, with or without connecting wires, embedded in ceramic insulation compacted within a metal protecting tube.

ice point, *n.*—the fixed point between ice and air-saturated water under a pressure of 1 standard atm (101325 N/m²). 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 sensin instruments calibrated by means of the values assigned to the defining fixed points.

kelvin, *n.*—the designation of the thermodynamic temperature scale and the degree 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 degree 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/m²). For a pure material this is also the freezing point.

partial immersion thermometer, *n.*—a liquid-in-glass thermometer designed to indicate temperatures correctly when the bulb and a specified part of the stem are exposed to the temperature being measured.

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, *n.*—the platinum standard to which the National Bureau of Standards referred thermoelectric measurements prior to 1973.

platinum 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 resistance thermometer, *n.*—a resistance thermometer that has had its temperature-resistance relationship determined in accordance with methods described in the text establishing the International Practical Temperature Scale.

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.
- reference point (liquid-in-glass thermometer), *n.***—a temperature at which a thermometer is checked for changes in bulb volume.
- 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.)
- saddle (liquid-in-glass thermometer), *n.***—the bottom support of the enclosed scale of an enclosed-scale thermometer.
- 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 *thermo-electric 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*.
- setting temperature (liquid-in-glass thermometer), *n.***—the temperature which causes a reading of zero on the main scale of an adjustable-range thermometer.
- sheath (enclosed-scale thermometer), *n.***—the cylindrical glass envelope which encloses the scale and capillary tube.
- 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 material, *n.***—one or more pairs of thermoelements (without measuring junction(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 thermoelement, *n.***—a thermoelement that has been calibrated with reference to platinum 27 or platinum 67.
- stem (liquid-in-glass thermometer), *n.***—the capillary tube through which the meniscus of the liquid moves with change of temperature.
- temperature interval (liquid-in-glass thermometer), *n.***—a specified portion of the range of a thermometer.
- 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 27 or platinum 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.

total immersion thermometer, *n*.—a liquid-in-glass thermometer designed to indicate temperatures correctly when just that portion of the thermometer containing the liquid is exposed to the temperature being measured. (Compare *complete immersion thermometer*).

total length (liquid-in-glass thermometer), *n*.—the overall length including any special finish at the top.

triple point (water), *n*.—the temperature of equilibrium between ice, water, and water vapor. This temperature is $+0.01^{\circ}\text{C}$ on the International Practical Temperature Scale of 1948.

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

verification (liquid-in-glass thermometer), *n*.—the process of testing a thermometer for compliance with specifications.

verification temperatures (liquid-in-glass thermometer), *n*.—the specified temperatures at which thermometers are tested for compliance with scale error limits.

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