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Designation: E 344 – 06

Terminology Relating to Thermometry and Hydrometry[1]

This standard is issued under the fixed designation E 344; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This terminology is a compilation of definitions of terms used by ASTM Committee E20 on Temperature Measurement.

1.2 Terms with definitions generally applicable to the fields of thermometry and hydrometry are listed in 3.1.

1.3 Terms with definitions applicable only to the indicated standards in which they appear are listed in 3.2.

1.4 Information about the International Temperature Scale of 1990 is given in Appendix X1.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

E 1 Specification for ASTM Liquid-in-Glass Thermometers
E 77 Test Method for Inspection and Verification of Thermometers
E 100 Specification for ASTM Hydrometers
E 126 Test Method for Inspection, Calibration, and Verification of ASTM Hydrometers
E 207 Test Method for Thermal EMF Test of Single Thermoelement Materials by Comparison with a Reference Thermoelement of Similar EMF-Temperature Properties
E 220 Test Method for Calibration of Thermocouples By Comparison Techniques
E 230 Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples
E 452 Test Method for Calibration of Refractory Metal Thermocouples Using a Radiation Thermometer
E 574 Specification for Duplex, Base Metal Thermocouple Wire With Glass Fiber or Silica Fiber Insulation
E 585/E 585M Specification for Compacted Mineral-Insulated, Metal-Sheathed, Base Metal Thermocouple Cable
E 601 Test Method for Comparing EMF Stability of Single-Element Base-Metal Thermocouple Materials in Air[3]
E 608/E 608M Specification for Mineral-Insulated, Metal-Sheathed Base Metal Thermocouples
E 644 Test Methods for Testing Industrial Resistance Thermometers
E 667 Specification for Mercury-in-Glass, Maximum Self-Registering Clinical Thermometers
E 696 Specification for Tungsten-Rhenium Alloy Thermocouple Wire
E 710 Test Method for Comparing EMF Stabilities of Base-Metal Thermoelements in Air Using Dual, Simultaneous, Thermal-EMF Indicators[3]
E 780 Test Method for Measuring the Insulation Resistance of Mineral-Insulated, Metal-Sheathed Thermocouples and Thermocouple Cable at Room Temperature
E 825 Specification for Phase Change-Type Disposable Fever Thermometer for Intermittent Determination of Human Temperature
E 839 Test Methods for Sheathed Thermocouples and Sheathed Thermocouple Material
E 879 Specification for Thermistor Sensors for Clinical Laboratory Temperature Measurements
E 1061 Specification for Direct-Reading Liquid Crystal Forehead Thermometers
E 1104 Specification for Clinical Thermometer Probe Covers and Sheaths
E 1112 Specification for Electronic Thermometer for Intermittent Determination of Patient Temperature
E 1129/E 1129M Specification for Thermocouple Connectors
E 1137/E 1137M Specification for Industrial Platinum Resistance Thermometers
E 1159 Specification for Thermocouple Materials, Platinum-Rhodium Alloys, and Platinum
E 1256 Test Methods for Radiation Thermometers (Single Waveband Type)
E 1299 Specification for Reusable Phase-Change-Type Fever Thermometer for Intermittent Determination of Human Temperature

[1] This terminology is under the jurisdiction of ASTM Committee E20 on Temperature Measurement and is the direct responsibility of Subcommittee E20.91 on Editorial and Terminology.

Current edition approved May 1, 2006. Published May 2006. Originally approved in 1968. Last previous edition approved in 2002 as E 344 – 02.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Withdrawn.

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E 1350 Guide for Testing Sheathed Thermocouples Prior to, During, and After Installation
E 1502 Guide for Use of Freezing-Point Cells for Reference Temperatures
E 1594 Guide for Expression of Temperature
E 1684 Specification for Miniature Thermocouple Connectors
E 1750 Guide for Use of Water Triple Point Cells
E 1751 Guide for Temperature Electromotive Force (EMF) Tables for Non-Letter Designated Thermocouple Combinations
E 1965 Specification for Infrared Thermometers for Intermittent Determination of Patient Temperature

2.2 *Other Standards, Supplementary Vocabularies, and Sources:*[4]

International Vocabulary of Basic and General Terms in Metrology (VIM) 1993
Guide to the Expression of Uncertainty in Measurement (GUM) 1995

3. Terminology

3.1 *Definitions:*

accuracy, *n—of a temperature measurement*, closeness of agreement between the result of a temperature measurement and a true value of the temperature.

DISCUSSION—Accuracy is a qualitative concept.

base metal thermocouple, *n*—thermocouple whose thermoelements are composed primarily of base metals and their alloys. (See also **noble metal thermocouple; refractory metal thermocouple**.)

DISCUSSION—Base metals used in thermoelements include nickel, iron, chromium, copper, aluminum. Letter-designated types E, J, K, T, and N are considered base metal thermocouples.

bias, *n*—the scatter between the mean values of subsets of data, from each other or from the accepted value.

blackbody, *n*—the perfect or ideal source of thermal radiant power having a spectral distribution described by the Planck equation.

DISCUSSION—The term blackbody is often used to describe a furnace or other source of radiant power which approximates the ideal.

bulb, *n—of a liquid-in-glass thermometer*, reservoir for the thermometric liquid.

calibration, *n— of a thermometer or thermometric system*, the set of operations that establish, under specified conditions, the relationship between the values of a thermometric quantity indicated by a thermometer or thermometric system and the corresponding values of temperature realized by standards.

DISCUSSION—(1) The result of a calibration permits either the assignment of values of temperature to indicated values of thermometric quantity or determination of corrections with respect to indications. (2) A calibration may also determine other metrological properties such as the effect of influence quantities. (3) The result of a calibration may be communicated in a document such as a calibration certificate or a calibration report. (4) The term *calibration* has also been used to refer to the result of the operations, to representations of the result, and to the actual relationship between values of the thermometric quantity and temperature.

calibration point, *n*—a specific value, established by a reference, at which the indication or output of a measuring device is determined.

Celsius, *adj*—pertaining to or denoting something related to the expression of temperature in degrees Celsius.

DISCUSSION—For example, "A **Celsius** thermometer has a scale marked in degrees Celsius."

center wavelength, *n*—a wavelength, usually near the middle of the band of radiant power over which a radiation thermometer responds, that is used to characterize its performance.

DISCUSSION—The value of the center wavelength is usually specified by the manufacturer of the instrument.

clinical thermometer, *n*—thermometer of any type designed to measure human body temperature.

DISCUSSION—Some clinical thermometers may be designed to measure the body temperature of animals.

coaxial thermocouple—a thermocouple consisting of a thermoelement in wire form within a thermoelement in tube form with the wire being electrically insulated from the tube except at the measuring junction.

compensating extension wires, *n*—those extension wires fabricated from materials basically different in composition from the thermocouple.

DISCUSSION—They have similar thermoelectric properties and within a stated temperature range effectively transfer the reference junction to the other end of the wires.

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** and **partial immersion thermometer.**)

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 point, *n*—thermometric fixed point of an idealized system, to which a numerical value has been assigned, used in defining a temperature scale.

degree Celsius, °C, *n*—derived unit of temperature in the International System of Units (SI). (See **kelvin**.)

DISCUSSION—At any temperature, an interval of one degree Celsius is the same as an interval of one kelvin, by definition. For information about the relation between units and values of temperature expressed in different units, see Guide E 1594.

degree centigrade, *n*—obsolete term. Use **degree Celsius.**

degree Fahrenheit, °F, *n*—non-SI unit of temperature commonly used in the United States of America.

DISCUSSION—At any temperature, an interval of one degree Fahrenheit is the same as an interval of 5/9 kelvin (or 5/9 degree Celsius). For

[4] Available from International Organization for Standardization (ISO), 1 rue de Varembé, Case postale 56, CH-1211, Geneva 20, Switzerland.

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information about the relation between units and values of temperature expressed in different units, see Guide E 1594.

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

error, *n—of a temperature measurement*, result of a temperature measurement minus a true value of temperature.

extension wires, *n*—those having temperature-emf characteristics that when connected to a thermocouple effectively transfer the reference junction to the other end of the wires. (Compare **compensating wires).**

Fahrenheit, *adj*—pertaining to or denoting something related to the expression of temperature in degrees Fahrenheit.

DISCUSSION—For example, "A **Fahrenheit** thermometer has a scale marked in degrees Fahrenheit."

fixed point, *n— in thermometry*, reproducible temperature of equilibrium of a system of two or more phases under specified conditions.

freezing point, *n*—fixed point of a single component system in which liquid and solid phases are in equilibrium at a specified pressure, usually 101 325 Pa, and the system is losing heat slowly. (Compare **melting point**.)

ice point, *n*—thermometric fixed point of ice and water saturated with air at a pressure of 101 325 Pa.

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

International Practical Temperature Scale of 1968 (IPTS-68), *n*—the temperature scale adopted by the 13th General Conference on Weights and Measures in 1968.

DISCUSSION—The IPTS-68 was superseded in 1990 by the International Temperature Scale of 1990.

International Temperature Scale of 1990 (ITS-90), *n*—the temperature scale prepared in accordance with instructions of the 18th General Conference on Weights and Measures, and adopted on January 1, 1990.

kelvin, K, *n*—base unit of temperature in the International System of Units (SI).

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 bulb.

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

maximum permissible errors, *n—of a thermometer or thermometric system*, extreme values permitted by regulation or specification of the difference between the indication of a thermometer or thermometeric system and the true value of temperature.

DISCUSSION—The term *tolerance* is sometimes used in ASTM standards to represent this concept.

maximum self-registering clinical thermometer, *n*—clinical thermometer designed to retain the indication of its maximum measured temperature until reset.

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

melting point, *n*—fixed point of a single component system in which liquid and solid phases are in equilibrium at a specified pressure, usually 101 325 Pa, and the system is gaining heat slowly. (Compare **freezing point**.)

noble metal thermocouple, *n*—thermocouple whose thermoelements are composed primarily of noble metals and their alloys. (See also **base metal thermocouple; refractory metal thermocouple**.)

DISCUSSION—Noble metals used in thermoelements include platinum, rhodium, gold, palladium, iridium. Letter designated types B, R, and S are considered noble metal thermocouples.

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 temperatures being measured. (Compare **complete immersion thermometer** and **total immersion thermometer.**)

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

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.

precision, *n*—the scatter between individual values of test data within the subset, normally computed with respect to the mean of the subset. (See **bias**.)

probe cover and sheath, *n*—a device provided for the purpose of preventing biological contact between the patient and the probe or thermometer.

protecting tube, *n*—a tube designed to enclose a temperature-sensing device and protect it from the deleterious effects of the environment.

DISCUSSION—It may provide for attachment to a connection head but is not primarily designed for pressure-tight attachment to a vessel. (See also **thermowell**.)

radiation thermometer, *n*—a radiometer calibrated to indicate the temperature of a blackbody.

radiometer, *n*—a device for measuring radiant power that has an output proportional to the intensity of the input power.

range, *n—of a thermometer of thermometric system*, a set of temperatures within specified lower and upper tempurature limits.

DISCUSSION—The "operating range," "measuring range," working range," or "scale range" is the set of exposure temperatures for the sensing portion of a thermometer or thermometric system that permits temperature measurements to be made with specified uncertainty. With certain liquid-in-glass thermometers, an auxiliary scale or reference scale is provided. The "range" of such liquid-in-glass thermometers includes only the "working range" or "measuring range" and does not include the auxiliary scale or reference scale (when applicable).

DISCUSSION—The "storage temperature range" or "non-operating temperature range" is set of exposer temperatures that the thermometer or thermometric system can endure without adversely affecting the ability to make temperature measurements with specified uncertainty when subsequently placed into service. Some specifications provide for a maximum increase in specified uncertainty after exposer to the

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storage temperature range for a specified period of time.

DISCUSSION—The "ambient temperature range" is the set of exposure temperatures that the indication or display portion of the thermometer or thermometric system can endure during the measurement process without adversely affecting the ability to make temperature measurements.

DISCUSSION—See also **span**.

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

reference temperature, *n*—a fixed, reproducible temperature, to which a value is assigned, that can be used for the calibration of thermometers or other purposes.

refractory metal thermocouple, *n—(1)* one whose thermoelements have melting points above 1935 °C (3515 °F).*(2)* thermocouple whose thermoelements are composed primarily of refractory metals and their alloys. (See also **base metal thermocouple; noble metal thermocouple**.)

DISCUSSION—Refractory metals used in thermoelements include tungsten, rhenium, and molybdenum.

repeatability, *n—of results of temperature measurements*, closeness of agreement between the results of successive measurements of the same temperature carried out under the same conditions of measurement.

DISCUSSION—(1) Repeatability conditions include the same measurement procedure; the same observer; the same thermometer or thermometeric system, used under the same conditions; the same location; and repetition over a short interval of time. (2) Repeatability may be expressed quantitatively in terms of the dispersion characteristics of the results such as the mean value and standard deviation.

reproducibility, *n—of results of temperature measurements*, closeness of agreement between the results of measurements of the same temperature carried out under changed conditions of measurement.

DISCUSSION—(1) A valid statement of reproducibility requires specification of the conditions changed. (2) The changed conditions may include principle of measurement, method of measurement, observer, thermometer or thermometric system, reference standard(s), location, conditions of use, and time. For ASTM standard test methods, the method is not changed. (3) Reproducibility may be expressed quantitatively in terms of the dispersion characteristics of the results such as the mean value and standard deviation. (4) Results are here usually understood to be corrected results.

resistance thermometer, *n*—a temperature-measuring device comprised of a resistance thermometer element, internal connecting wires, a protective shell with or without means for mounting, a connection head, or connecting wire or other fittings, or both.

resistance thermometer element, *n*—the temperature-sensitive portion of the thermometer composed of resistance wire, film or semiconductor material, its supporting structure, and means for attaching connecting wires.

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. (Same as **thermoelectric power**).

Seebeck emf, *n*—an electrical potential difference between two points in a region of electrically conducting material that exists solely because of temperature gradients between those two points in the material.

sensor, *n—of a thermometer or thermometric system*, element of the thermometer or thermometric system that is directly affected by the temperature to be measured.

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 wire, *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—of a thermometer or thermometric system,* the absolute value of the difference between the specified lower and upper temperature limits within a range.

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

stem, *n—of a liquid-in-glass thermometer*, capillary tube through which the meniscus of the thermometric liquid moves with change of temperature.

target plane, *n*—the plane, perpendicular to the line of sight of a radiation thermometer, that is in focus for that instrument.

temperature coefficient of resistance, α, *n*—the ratio of the fractional change in electrical resistance of a substance to a corresponding change in temperature of that substance.

DISCUSSION—(1) The temperature coefficient of resistance is given by $\alpha\ (T) = (1/R)\ (\mathrm{d}R/\mathrm{d}T)$, where α is the symbol representing the temperature coefficient of resistance, *R* is the resistance of the thermometer resistor at temperature *T*, and $(\mathrm{d}R/\mathrm{d}T)$ is the first derivative of *R* with respect to *T*. (2) The dimension of α is reciprocal temperature. In general, $\alpha = \alpha\ (T)$ is a function of temperature. (3) For platinum resistance thermometers, over the temperature interval 0 °C to 100 °C, the platinum resistor has been characterized historically by an average temperature coefficient of resistance using $\alpha = (R_{100} - R_0)/100R_0$, where R_0 is the resistance at 0 °C and R_{100} is the resistance at 100 °C. The value of α for industrial platinum resistance thermometers specified in Specification E 1137/E 1137M can be derived from the coefficients *A* and *B* given in that standard using $\alpha = A + 100B$.

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. (Same as **Seebeck emf**).

thermistor, *n*—a semiconductor, the primary function of which is to exhibit a monotonic decrease in electrical resistance with an increase in sensor temperature, that is, a semiconductor for which the temperature coefficient of resistance is negative and exhibits neither discontinuities nor changes in sign.

thermistor, *n*—a temperature sensor employing a semiconductor that exhibits a large continuous change in electrical resistance with a change in sensor temperature, that is, a

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semiconductor for which the temperature coefficient of resistance is either negative or positive and exhibits no discontinuities.

DISCUSSION—A negative temperature coefficient thermistor (NTC) is a ceramic semiconductor that exhibits a monotonic decrease in electrical resistance with an increase in sensor temperatures and exhibits no changes in sign.

DISCUSSION—A positive temperature coefficient thermistor (PTC) is a semiconductor that exhibits an increase in electrical resistance with an increase in sensor temperature when used within its normal operating range. One type of PTC thermistor exhibits a monotonic increase in electrical resistance with increasing temperature and exhibits no changes in sign . Another type of PTC thermistor has a transition or switching temperature that is determined by its physical composition. The temperature coefficient of resistance for this switching type device exhibits a slight negative value at temperatures below the transition temperature, becomes zero in the region of the transition temperature and then exhibits a large positive value at temperatures above the transition temperature. The electrical resistance of these switching PTC devices is a relatively low value at low body temperatures, decreases to a minimum value in the region of the transition temperature and then rapidly increases to an extremely high value as the device is heated above the transition temperature.

thermocouple, *n*— *in thermometry*, the sensor of a thermoelectric thermometer, consisting of electrically conducting circuit elements of two different thermoelectric characteristics joined at a junction.

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

thermocouple calibration, *n*—the process of determining the emf developed by a thermocouple with respect to temperature established by a standard.

thermoelectric power, *n*—the rate of change of thermal emf with temperature at a given temperature. (Same as **Seebeck coefficient**).

thermoelectric thermometer, *n*—thermometer for which the thermometric quantity is an emf produced by the Seebeck effect.

thermoelement, *n*—one of the circuit elements comprising a thermocouple.

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

thermometric fixed point, *n*—fixed point useful in the practice of thermometry.

thermopile, *n*—a number of similar 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. (See also **protecting tube**.)

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** and **partial immersion thermometer.**)

traceability, *n*—*of a temperature measurement*, the ability to relate, with scientific credibility, the result of a temperature measurement and its associated uncertainty to a stated temperature scale through a sequence of comparisons with references, usually national or international standards, whose values have been determined on the scale with stated uncertainty.

triple point, *n*—fixed point of a system in which three phases are in equilibrium.

triple point of water, *n*—triple point of the liquid, solid, and vapor phases of water.

DISCUSSION—The idealized triple point of water, to which a value of 273.16 K (0.01 °C) is assigned, is a defining fixed point for both the Kelvin Thermodynamic Temperature Scale (KTTS) and the International Temperature Scale of 1990 (ITS-90).

true value, *n*—*of a temperature*, value attributed to a particular temperature and accepted, sometimes by convention, as having an uncertainty appropriate for a given purpose.

DISCUSSION—(1) For example, in a given situation, the value assigned to a temperature determined by measurement with a reference standard thermometer may be taken as a true value. (2) This concept is often designated by the term *conventional true value.*

uncertainty, *n*— *of a temperature measurement*, parameter, derived from an analysis of a measurement and its result, that characterizes the range in which the true value of temperature is estimated to lie, generally with a given confidence.

DISCUSSION—The parameter may be, for example, a standard deviation (or a multiple of it), or the half-width of an interval having a stated level of confidence.

DISCUSSION—The parameter has many components. Some components may be evaluated by statistical methods; others may be based on experience, using assumed probability distributions.

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

3.2 ***Definitions of Terms Specific to a Standard:***

accuracy, *n*—ability of an *infrared thermometer* to give a reading close to the *true temperature.* **E 1965**

adjusted mode, *n*—output of an *IR thermometer* that gives temperature measured and calculated from a subject or object, by correcting such temperature for variations in ambient temperature, *subject's* temperature, emissivity, body site (that is, *oral*, or *rectal*), etc. **E 1965**

adjusting device, *n*—a section of the instrument used to adjust the amount of mercury in the bulb and main capillary to that needed for the intended temperature interval. **E 1**

alpha (α)—the temperature coefficient of resistance of a PRT over the range 0 to 100 °C. **E 1137/E 1137M**

amorphous silica fiber, *n*—a continuous filament of heat insulating material whose principal constituent is amorphous silica. **E 574**

API gravity, *n*—the gravity obtained from the following relationship:

$$API\ \text{Gravity, deg} = 141.5/(\text{sp gr } 60/60\ °F) - 131.5 \quad (1)$$

E 126

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axillary temperature, t_{ba}, *n*—temperature at the apex of either axilla (armpit) as measured by a *contact thermometer.* **E 1965**

band width or span (Δ), *n*—the temperature difference defined by the equation:

$$\Delta = SB - SR \quad (2)$$

E 1061

band width or span (Δ), *n*—the temperature difference defined by the following equation:

$$\Delta = T°470 - T°650 \quad (3)$$

E 1061

bath gradient error, *n*—the error caused by temperature differences in the working space of the bath. (The bath or temperature equalizing blocks should be explored to determine the work areas in which the temperature gradients are insignificant.) **E 644**

battery charger, *n*—an electrical circuit designed to restore the electrical potential of a battery. **E 1112**

blackbody, *n*—a reference source of infrared radiation made in the shape of a cavity and characterized by precisely known temperature of the cavity walls and having effective emissivity at the cavity opening arbitrarily considered equal to unity. **E 1965**

blackbody temperature, t_{BB}, *n*—temperature of blackbody cavity walls as measured by an imbedded or immersed *contact thermometer.* **E 1965**

bladder temperature, *n*—temperature of the interior of urinary bladder as measured by a *contact thermometer.* **E 1965**

body temperature, *n*—temperature measured from the interior of a human body cavity, such as pulmonary artery, distal esophagus, urinary bladder, ear canal, oral, or rectal. **E 1965**

bore—the hole or lumen in the stem. **E 667**

bulb length, *n*—the distance from the bottom of the bulb to the junction of the bulb and the stem tubing. **E 1**

bulk material length (BML), *n*—a single length of thermocouple material (produced from the same raw material lot) after completion of fabrication resulting in sheathed thermocouple material. **E 780, E 839**

cable end closure—a moisture barrier at the cable end of the sheath.

DISCUSSION—This does not necessarily constitute a hermetic seal. **E 1137/E 1137M**

calibration, *n*—the determination of the indications of a thermometer with respect to temperatures established by a standard resulting in scale corrections to be applied when maximum accuracy is required. **E 77**

calibration, *n*—the determination of the resistance-temperature relationship for a specific thermometer. The resistance-temperature relationship may be specified as the ratio of the resistance of the thermometer at a given temperature to its resistance at the ice point as a function of the temperature, or simply as the resistance of the thermometer as a function of the temperature. **E 644**

calibration date—the date on which the scale is affixed to a thermometer. **E 667**

center green (CG) or mid green (MG), *n*—that temperature which unifies the visual and instrumental evaluation methods and is defined by the equation:

$$CG = MG = \frac{SG + SB}{2} = T°520 \quad (4)$$

See 3.2.7.2 for description of T°520. **E 1061**

ceramic marking—marking by fusing a ceramic colorant onto the glass surface. **E 667**

clinical accuracy, *n*—ability of an infrared ear canal thermometer to give a reading close to *true temperature* of the site that it purports to represent. **E 1965**

clinical bias, $\bar{x}_d$, *n*—mean difference between IR thermometer output and an internal body site temperature from *subjects* at specified conditions of ambient temperature and humidity and averaged over a selected group of subjects. **E 1965**

clinical repeatability, s_r, *n*—pooled standard deviation of changes in multiple *ear canal temperature* readings as taken from the same subject from the same ear with the same *infrared thermometer* by the same operator within a relatively short time. **E 1965**

cold-laps—sheath surface defects where the sheath surface has been galled and torn by a drawing die and the torn surfaces smoothed by a subsequent diameter reduction. **E 839**

color play, *n*—the predictable sequence of colors exhibited by a liquid crystal formulation as it passes through its active temperature range. For example, as temperature increases, a formulation exhibits successive tan, red, green, and blue colors. **E 1061**

combined site offset, μ_s, *n*—calculated difference in degrees of measured temperature between a selected reference body site and *ear canal temperature* and averaged over the population of representative study samples. **E 1965**

common ungrounded junction, *n*—measuring junctions within the same multi-pair thermocouple that are electrically isolated from the sheath but electrically connected to each other. **E 608/E 608M**

connecting wire error, *n*—the error caused by uncompensated connecting wire resistance. (Although the connecting wire is part of the measurement circuit, most of it is not at the temperature that is being determined. Thermometers are available in two-, three-, and four-wire configurations. There is no satisfactory way to compensate for the wire resistance in the measurement with a two-wire thermometer although the wire resistance can be compensated for in three and four-wire thermometers.) **E 644**

connecting wires, *n*—the wires that run from the element through the cable end closure and external to the sheath. **E 1137/E 1137M**

connector pair, *n*—an assembly consisting of a plug and a jack, each having both positive and negative inserts, that will connect two parts of an electrical circuit and provide a means of physically disconnecting the two parts without the use of tools. **E 1129/E 1129M, E 1684**

constriction—an obstruction in the bore of a clinical thermometer which permits the passage of mercury from the bulb

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