



# Standard Specification for Thermistor Sensors for Clinical Laboratory Temperature Measurements<sup>1</sup>

This standard is issued under the fixed designation E 879; 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 specification covers the general requirements for negative temperature coefficient thermistor-type sensors intended to be used for clinical laboratory temperature measurements or control, or both, within the range from –10 to 105°C.

1.2 This specification also covers the detailed requirements for ASTM designated sensors.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

E 344 Terminology Relating to Thermometry and Hydrometry<sup>2</sup>

E 563 Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature<sup>2</sup>

F 29 Specification for Dumet Wire for Glass-to-Metal Seal Applications<sup>3</sup>

## 3. Terminology

3.1 *Definitions*—The definitions given in Terminology E 344 shall apply to this specification.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *dissipation constant, δ, n*—the ratio of the change in energy dissipated per unit time (power) in a thermistor,  $\Delta \dot{Q} = \dot{Q}_2 - \dot{Q}_1$ , to the resultant temperature change of the thermistor,  $\Delta t = t_2 - t_1$ .

$$\delta = \frac{\Delta \dot{Q}}{\Delta t} \quad (1)$$

The dimensions of the dissipation constant are W/K. For this specification,  $t_1$  is in the range from 20 to 38°C and  $\Delta t = 10^\circ\text{C}$ .

3.2.2 *dumet, n*—round, copper-coated 42 % nickel-iron wire intended primarily for sealing to soft glass. Also known as

CuNiFe in some communities.

3.2.3 *insulation resistance, dc, n*—the resistance at a specified direct-current voltage between the insulated leads of a thermistor sensor and the metallic enclosure of the sensor, if such an enclosure is present, or else between the sensor leads and a conductive medium in which the sensor is immersed.

3.2.4 *qualification test, n*—a series of tests conducted by the procuring agency or an agent thereof to determine conformance of thermistor sensors to the requirements of a specification, normally for the development of a qualified products list under the specification.

3.2.5 *response time, n*—the time required for a sensor to change a specified percentage of the total difference between its initial and final temperatures as determined from zero-power resistances when the sensor is subjected to a step function change in temperature.

3.2.6 *time constant, n*—the 63.2 % response time of a sensor that exhibits a single-exponential response.

3.2.7 *zero-power resistance, n*—the dc resistance of a device, at a specified temperature, calculated for zero-power.

3.2.7.1 *Discussion*—Accurate zero-power resistance is obtained by extrapolating to zero-power the resistance values obtained from measurements at three or more levels of power with the sensor immersed in a constant temperature medium. For the purpose of this specification, this is obtained from measurements at a single power level adjusted such that the power is not greater than one-fifth the product of the dissipation constant specified in Table 1 (see 3.2.1 and 7.3) and the appropriate tolerance requirement of Table 2. When making stability measurements, the power shall be kept constant.

## 4. Classification

4.1 Thermistor sensors covered by this specification shall be classified with a type designation code that includes the ASTM detailed specification number followed by a descriptive code. See Fig. 1.

4.2 *ASTM Specification Number*—The ASTM specification number specifies uniquely the design and construction of the sensor including the type designation if more than one type appears in the same specification.

4.2.1 *Type Designation*—The type designation shall be a letter symbol to indicate the design and construction of the thermistor sensor.

4.2.1.1 *Type S*—Silicone rubber-coated glass probe with

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 14.03.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 10.04.