



Standard Specification for Direct-Reading Liquid Crystal Forehead Thermometers¹

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1. Scope

1.1 This specification covers direct-reading liquid crystal forehead thermometers designed to monitor trends or measure human forehead surface temperatures, or both.

1.2 Thermometers covered by this specification are generally available in continuous or intermittent reading modes. Thermometers meeting the requirements specified herein shall be considered as complying with this specification.

1.3 The following precautionary caveat pertains only to the test method portion, Section 5, of this specification. *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 consult and 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 Hydrometry²

3. Terminology

3.1 **Definitions**—For definitions of terms used in this specification, refer to Terminology E 344.

3.2 Definitions of Terms Specific to This Standard:

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

$$CG = MG = \frac{SG + SB}{2} = T^{\circ}520$$

See 3.2.5.2 for description of T[°]520.

3.2.2 **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.

3.2.3 **manufacturing lot**, *n*—(1) in the case of continuous manufacturing processes, a lot is a specifically identified

amount produced in a unit of time or quantity in a manner that assumes its having uniform characteristics and quality within specified limits.

(2) In the case of batch processes, a lot means a batch or specifically identified portion of a batch assumed to have uniform characteristics and quality within specified limits.

3.2.4 **sequencing**, *n*—a characteristic whereby the thermal profiles of the liquid crystal formulations of a given thermometer follow each other in an orderly predetermined manner.

3.2.5 **specific color phenomena**, *n* (using instrumental methods of evaluation):

3.2.5.1 **blue**—that temperature at which the intensity of 470 nm light reflected by the liquid crystal is maximum, symbolized as T[°]470.

3.2.5.2 **green**—that temperature at which the intensity of 520 nm light reflected by the liquid crystal is maximum, symbolized as T[°]520.

3.2.5.3 **red**—that temperature at which the intensity of 650 nm light reflected by the liquid crystal is maximum, symbolized as T[°]650.

3.2.6 **start of blue (SB)**, *n*—that temperature at which the liquid crystal first begins to reflect blue light, which is defined as light having a wavelength of 491 nm.

3.2.7 **start of green (SG)**, *n*—that temperature at which the liquid crystal first begins to reflect green light, which is defined as light having a wavelength of 575 nm.

3.2.8 **start of red (SR)**, *n*—that temperature at which the liquid crystal first begins to reflect red light, which is defined as light having a wavelength of 675 nm.

3.2.9 **thermal profile**, *n*—temperatures at which specific color phenomena occur in a liquid crystal thermometer.

3.2.10 **visible start (VS)**, *n*—that temperature at which the liquid crystal first begins to reflect visible light.

4. Requirements

4.1 **General**—Thermometers represented as complying with this specification shall meet all of the requirements specified herein.

4.2 **Temperature Range**—The liquid crystal forehead thermometer shall, as a minimum, meet all requirements of this specification over the temperature range of 32.0 to 38.0°C (90 to 100°F). Some color must remain visible up to temperatures of 39.5°C (103°F).

4.3 **Tolerance**—Whenever a temperature for a specific color phenomenon (3.2.1) is measured, the maximum permissible

¹ This specification is under the jurisdiction of ASTM Committee E20 on Temperature Measurement and is the direct responsibility of Subcommittee E20.08 on Medical Thermometry.

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² *Annual Book of ASTM Standards*, Vol 14.03.