



Designation: D8394 – 21

Standard Test Method for Automated Measurement of Maturity, Fineness, Ribbon Width, and Micronaire of Cotton Fibers¹

This standard is issued under the fixed designation D8394; 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 test method covers the determination of linear density (gravimetric fineness hereafter stated as fineness), maturity, micronaire, and ribbon width of cotton fibers from a loose, chemically untreated sample taken before harvest, during ginning, during mill processing or unraveled from raw (undyed) yarn or fabric.

1.2 This test method requires the use of an integrated instrument, for example, the Cottonscope (see Fig. 1), that measures the maturity, fineness, ribbon width, and micronaire of cotton fiber.²

NOTE 1—For another test method to determine the maturity of cotton fibers, refer to Test Method D1442.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:³

D123 Terminology Relating to Textiles

D1441 Practice for Sampling Cotton Fibers for Testing
D1442 Test Method for Maturity of Cotton Fibers (Sodium Hydroxide Swelling and Polarized Light Procedures)
D1776 Practice for Conditioning and Testing Textiles
D7139 Terminology for Cotton Fibers
E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

3. Terminology

3.1 Definitions:

3.1.1 For all terminology relating to D13.11, Cotton Fibers, refer to Terminology D7139. The following terms are relevant to this standard; fineness, maturity, micronaire, ribbon width, and snippet.

3.1.2 *fineness, gravimetric, n*—the linear mass density of fiber measured in millitex (mtex). Synonymous with linear density (ASTM's definition for linear density – mass per unit length).

3.1.3 *ribbon width, n*—the distance measured in microns (μm) across an individual cotton fiber width in longitudinal section viewed under a polarized light microscope.

3.1.4 *snippet, n*—fibers cut into very short lengths of less than 1 mm.

3.1.5 For all other terminology related to textiles, refer to Terminology D123.

4. Summary of Test Method

4.1 Cotton fibers are cut into snippets no greater than 1 mm using scissors, a guillotine or mechanical corer. The snippets are weighed, dropped into a water filled bowl and dispersed by a magnetic stirrer so that they spread randomly across the instrument's digital camera viewing port. Two to three droplets of a non-foaming surfactant can be used to aide dispersion of the snippets in the water bath. The individualized and dispersed fibers are then photographed under polarized light and the data collected by the instrument's software, which analyzes the color images to determine fineness, maturity, micronaire and ribbon width.

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.11 on Cotton Fibers.

Current edition approved July 1, 2021. Published September 2021. DOI: 10.1520/D8394-21.

² The sole source of supply of the apparatus known to the committee at this time is Cottonscope Pty. Ltd., 13 Willcock Street, Ardress 6153, Western Australia. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

³ 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.



FIG. 1 Cottonscope Instrument

more easily during processing and have a tendency to form into neps (small entanglements) during processing in the spinning mill. These consequences adversely affect yarn and fabric quality and appearance. Yarn and fabric produced from immature fiber is typically also less lustrous and does not take up dye consistently so yarn and fabric appearance may be different after dyeing.

5.2 Maturity has a high positive correlation with fiber length and strength but genetic differences and differences in fiber wall thickness caused by plant diseases, soil, and water conditions during the growing season interfere with this relationship.

5.2.1 Fine fibers are required for fine count yarn manufacture and fiber fineness affects yarn count, evenness and strength. Both fineness and ribbon width are strong genetic traits evident between species and affected by growing conditions within species.

5.2.2 Micronaire has traditionally been used as a measure of fiber fineness although the value actually measures fiber specific surface area or surface area per unit weight. As a result, micronaire varies concomitantly with both maturity and fineness (see Fig. 2). Maturity and fineness are related to mi-

5. Significance and Use

5.1 Cotton fiber that is on average finer and more mature is more desirable than coarse or immature fiber, although distinction between these qualities cannot be made quickly and accurately using current test methods. Immature fibers break

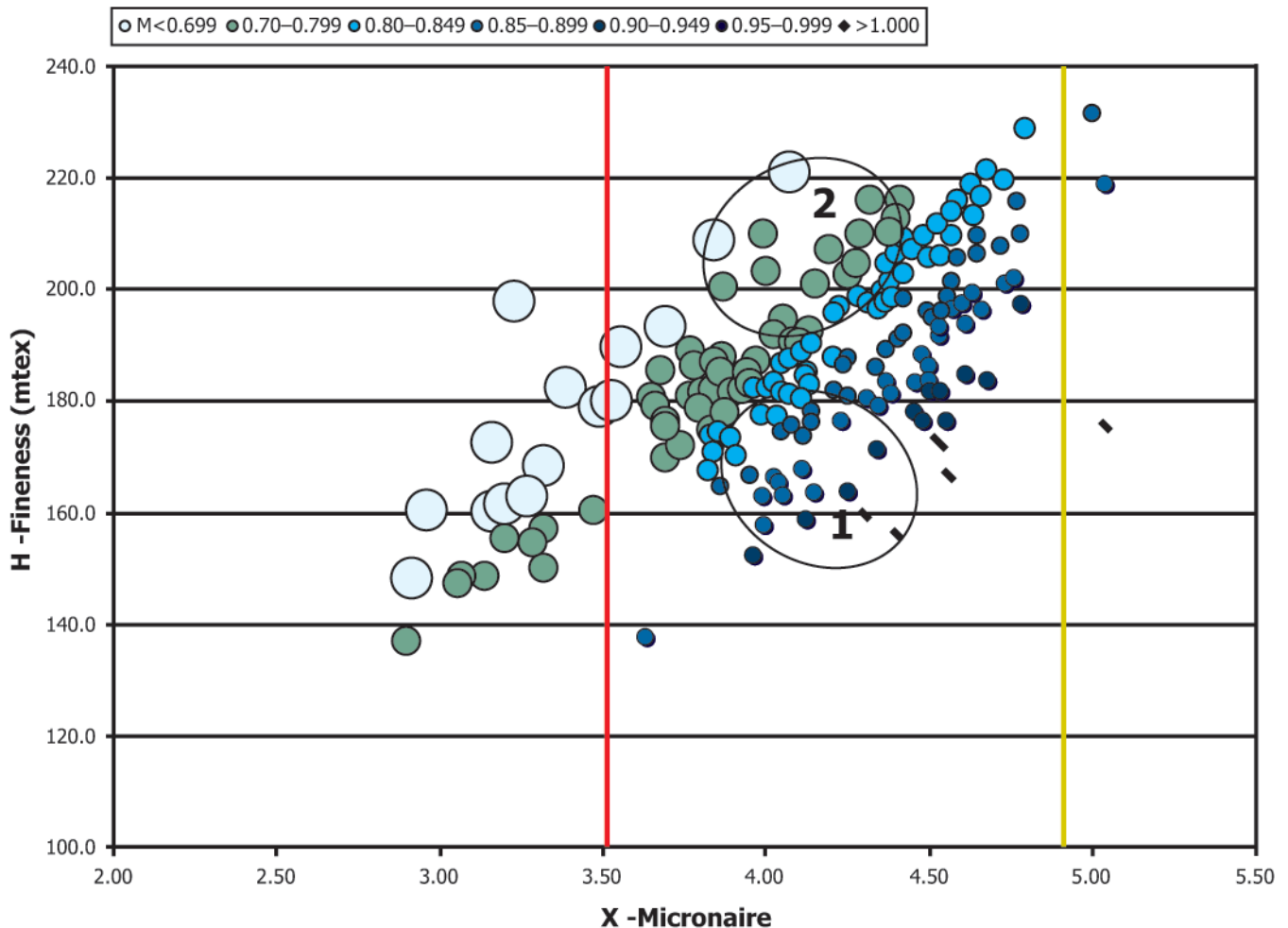


FIG. 2 Relationship Between Micronaire (X), Fineness (H), and Maturity (M)