



Designation: D2210 – 21

Standard Test Method for Grain Crack and Extension of Leather by the Mullen Test¹

This standard is issued under the fixed designation D2210; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of the resistance of leather to grain cracking and for measuring the extension of the leather. It is limited to light leathers such as shoe uppers, garment, gloves, and upholstery. This test method does not apply to wet blue or wet white.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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

1.4 *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:²

D1610 Practice for Conditioning Leather and Leather Products for Testing

D1813 Test Method for Measuring Thickness of Leather Test Specimens

3. Terminology

3.1 Definitions:

¹ This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.03 on Footwear. This test method was developed in cooperation with the American Leather Chemists Assn. (Standard Method E58 – 1965).

Current edition approved Dec. 1, 2021. Published January 2022. Originally approved in 1963 as D2210 – 63T. Last previous edition approved in 2013 as D2210 – 13. DOI: 10.1520/D2210-21.

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.

3.1.1 *extension*—the amount of stretch of leather over the diaphragm under pressure.

3.1.2 *grain cracking*—the appearance of cracks on the surface of the leather as the leather is extended over a diaphragm under pressure to form a sphere.

4. Significance and Use

4.1 The test method is designed to measure the force required to crack the grain of leather by steady hydraulic pressure on a diaphragm of definite diameter applied to the flesh side of the specimen to form a sphere. The cracking of the grain is a result of failure under elongation or stretch. The elongation or stretch of the leather can be measured at different loads or at the failure of the grain to determine if the stress leather will withstand under lasting conditions. Cuts, scratches, and other defects will cause considerable variation in the results by concentration of the applied force to the weak points. This test method is excellent for manufacturing control, specification acceptance, and service evaluation in the lasting property of leather. This test method may not apply when the conditions of the test employed differ widely from those specified in the test method.

5. Apparatus

5.1 *Testing Machine*,³ as shown in Fig. 1. The machine shall be hand- or power-driven. The machine shall hold the specimen firmly, without slippage, between two annular, plane, unpolished (matte) surfaces that may have fine, spiral tool marks not over 0.010 in. (0.25 mm) in depth.

5.2 *Upper Clamping Surface*—The upper clamping surface (clamping ring) shall have a circular opening 1.240 in. $\pm$ 0.010 in. (31.50 mm $\pm$ 0.25 mm) in diameter and shall be connected to the clamping mechanism through a swivel joint to ensure an even clamping pressure.

5.3 *Lower Clamping Surface*—The lower clamping surface (diaphragm plate) shall be 0.219 in. $\pm$ 0.003 in. (5.56 mm $\pm$

³ The sole source of supply of the apparatus known to the committee at this time is B. F. Perkins, 939 Chicopee St., Chicopee, MA 01013-2797, (413) 536-1311. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.