



Standard Test Method for Dynamic Tear Testing of Metallic Materials¹

This standard is issued under the fixed designation E604; 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 dynamic tear (DT) test using specimens that are $\frac{3}{16}$ in. to $\frac{5}{8}$ in. (5 mm to 16 mm) inclusive in thickness.

1.2 This test method is applicable to materials with a minimum thickness of $\frac{3}{16}$ in. (5 mm).

1.3 The pressed-knife procedure described for sharpening the notch tip generally limits this test method to materials with a hardness level less than 36 HRC.

NOTE 1—The designation 36 HRC is a Rockwell hardness number of 36 on Rockwell C scale as defined in Test Methods E18.

1.4 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.

1.5 *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:²

B221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

E6 Terminology Relating to Methods of Mechanical Testing

E18 Test Methods for Rockwell Hardness of Metallic Materials

E399 Test Method for Linear-Elastic Plane-Strain Fracture Toughness K_{Ic} of Metallic Materials

¹ This test method is under the jurisdiction of ASTM Committee E28 on Mechanical Testing and is the direct responsibility of Subcommittee E28.07 on Impact Testing.

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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. Terminology

3.1 Definitions of Terms Common in Mechanical Testing:

3.1.1 The definitions of mechanical testing terms that appear in Terminology E6 apply to this test method.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *dynamic tear (DT) energy*—the total energy required to fracture DT specimens tested in accordance with the provisions of this test method.

3.2.1.1 *Discussion*—With pendulum-type machines, the DT energy is the difference between the initial and the final potential energies of the pendulum or pendulums.

3.2.1.2 *Discussion*—With drop-weight machines, the DT energy is the difference between the initial potential energy of the hammer and the final energy of the hammer as determined by a calibrated energy measurement system.

3.2.2 *percent shear fracture appearance*—the percent of the net section that fractured in a shear mode.

3.2.2.1 *Discussion*—Net section may be either the net section area before fracture or the area of the projected plane of the fracture surface.

4. Summary of Test Method

4.1 The DT test involves a single-edge notched beam that is impact loaded in three-point bending, and the total energy loss during separation is recorded.

4.2 The DT specimens are fractured with pendulum or drop-weight machines.

5. Significance and Use

5.1 The DT energy value is a measure of resistance to rapid progressive fracturing. In a number of applications, the enhanced resistance that may develop during about one plate thickness of crack extension from a sharp notch is of major interest. In the test method, a sufficiently long fracture path is provided so that the results serve as a measure of this property.

5.2 Fracture surfaces of nonaustenitic steels tested in their temperature transition region have areas that appear bright and areas that appear dull. The bright, faceted appearing areas are termed “cleavage” fracture, and the dull appearing areas are termed “shear” fracture after their respective mode of fracture on a micro scale.

*A Summary of Changes section appears at the end of this standard