

**Designation: D 1822M – 93**
METRIC

AMERICAN SOCIETY FOR TESTING AND MATERIALS

1916 Race St. Philadelphia, Pa 19103

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Standard Test Method for Tensile-Impact Energy to Break Plastics and Electrical Materials [Metric]¹

This standard is issued under the fixed designation D 1822M; 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 the energy required to rupture standard tension-impact specimens of plastic or electrical insulating materials. Materials that can be tested by this test method are those too flexible or too thin to be tested in accordance with Test Methods D 256, as well as more rigid materials.

NOTE 1—This test method is the metric counterpart of Test Method D 1822.

1.2 *This standard does not purport to address all of the safety problems, 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:

- D 256 Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials²
- D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing²
- D 638 Test Method for Tensile Properties of Plastics²
- D 883 Terminology Relating to Plastics²
- D 1822 Test Method for Tensile-Impact Energy to Break Plastics and Electrical Insulating Materials²
- D 1898 Practice for Sampling of Plastics²
- D 4000 Classification System for Specifying Plastic Materials³
- D 4066 Specification for Nylon Injection and Extrusion Materials³
- E 23 Test Methods for Notched Bar Impact Testing of Metallic Materials⁴

3. Terminology

3.1 *Definitions*—Definitions of terms applying to this test method appear in Terminology D 883.

4. Summary of Test Method

4.1 The energy utilized in this test method is delivered by a single swing of a calibrated pendulum of a standardized

tension-impact machine. The energy to fracture by shock in tension is determined by the kinetic energy extracted from the pendulum of an impact machine in the process of breaking the specimen. One end of the specimen is mounted in the pendulum. The other end of the specimen is gripped by a crosshead that travels with the pendulum until the instant of impact and instant of maximum pendulum kinetic energy, when the crosshead is arrested.

5. Significance and Use

5.1 Tensile-impact energy is the energy required to break a standard tension-impact specimen in tension by a single swing of a standard calibrated pendulum under a set of standard conditions (Note 2). In order to compensate for the minor differences in cross-sectional area of the specimens as they will occur in the preparation of the specimens, the energy to break can be normalized to units of kilojoules per square metre of minimum cross-sectional area. An alternative approach to normalizing the impact energy that compensates for these minor differences and still retains the test unit as joules is shown in Section 11. For a perfectly elastic material the impact energy might be reported per unit volume of material undergoing deformation. However, since much of the energy to break the plastic materials for which this test method is written is dissipated in drawing of only a portion of the test region, such normalization on a volume basis is not feasible. The test method permits two specimen geometries so that the effect of elongation or rate of extension, or both, upon the result can be observed. With the Type S (short) specimen the extension is comparatively low, while with the Type L (long) specimen the extension is comparatively high. In general, the Type S specimen (with its greater occurrence of brittle fracture) gives greater reproducibility, but less differentiation among materials. Results obtained with different capacity machines may not be comparable.

NOTE 2—Friction losses are largely eliminated by careful design and proper operation of the testing machine. Attention is drawn to Test Methods E 23 for a general discussion of impact equipment and procedures.

5.2 The scatter of data may be due to different failure mechanisms within a group of specimens. Some materials may exhibit a transition between different failure mechanisms; if so, the elongation will be critically dependent on the rate of extension encountered in the test. The impact energy values for a group of such specimens will have an abnormally large dispersion. Some materials retract at failure with insignificant permanent set. With such materials it may not be possible to determine the type of failure, ductile, or brittle,

¹ This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.10 on Mechanical Properties.

Current edition approved Oct. 15, 1993. Published December 1993. Originally published as D 1822M – 83. Last previous edition D 1822M – 89.

² Annual Book of ASTM Standards, Vol 08.01.

³ Annual Book of ASTM Standards, Vol 08.02.

⁴ Annual Book of ASTM Standards, Vol 03.01.