



Tearing Strength of Textile Materials by Trapezoid Method

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This test procedure covers the measurement of the tearing strength of textile materials by the trapezoid method using a recording constant rate of extension (CRE) type tensile testing machine.

1.2 Applicability. This procedure applies to automotive fabrics. Tearing strength, as measured in this method, requires that the tear be initiated before testing. The tearing strength value(s) obtained as a result of this test are not directly related to the force required to initiate a tear.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3221

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment. Apparatus for conditioning to the appropriate requirements as described in GMW3221 Code A, unless otherwise specified in the relevant materials specification.

3.2.1 Tensile Testing Machine. An electronic CRE tensile testing machine is required. A CRE type tensile testing machine is defined as an apparatus in which the pulling clamp moves at a uniform rate, and the force measuring mechanism (load cell) moves a negligible distance with increasing force, <0.13 mm. The machine shall include a force indicating mechanism which will indicate (or record) continuously, the force applied to the test specimen and the accompanying elongation, when needed. This mechanism shall be capable of measuring force and elongation to the tolerances specified in this test procedure, as well of the following:

- The force-measuring system, including the recording mechanism, shall have a full scale pen response time <2 s in either direction.
- The maximum allowable error in force indication shall be $\pm 0.5\%$ of the reading.
- The maximum allowable error in recorded grip displacement shall be $\pm 1\%$ of the recorded values.
- The maximum allowable variation in nominal gage length on repeated return of the clamps to their starting position shall be <0.25 mm.
- The maximum allowable variation of the crosshead speed of the tester from the required testing speed shall be <4%.

3.2.2 Local requirements for calibration and accuracy must be satisfied.

3.2.3 The clamping device of the tensile testing machine shall be able to securely hold the test specimen over its width, without damage.

3.2.4 Clamps with dimensions of 25 mm × 75 mm with the smaller dimension parallel to the direction of traverse.

3.2.5 Cutting Die or Template. Having the shape and dimensions shown in Appendix A, Figure A1.

3.2.6 Trapezoid-Shaped Template. Having dimensions as shown in Appendix A, Figure A1.

3.3 Test Vehicle/Test Piece. When testing test specimens, which could be damaged by the clamps (e.g., fibers), the test specimens shall be protected at the clamps

3.4 Test Time.

Calendar time:	1 day
Test hours:	1 hour
Coordination hours:	Not applicable

3.5 Test Required Information.

3.6 Personnel/Skills. Personnel trained in accordance with the laboratory accreditation and Standard Operating Procedure requirements.

4 Procedure

4.1 Preparation.

4.1.1 The size of the test specimen is 75 mm ± 1 mm × 150 mm minimum.

4.1.2 A minimum of three (3) test specimens in each direction shall be prepared.

4.1.3 Consider the long direction as the direction of test. In cutting test specimens, take care to align the yarns running in the short direction parallel with the die/template such that when the slit is cut, the subsequent tear will take place between these yarns and not across them.

4.1.4 Mark each test specimen with an isosceles trapezoid template. Make a preliminary cut 10 mm ± 0.5 mm long at the center of the short edge of the trapezoid (Appendix A, Figure A1).

4.1.5 Unless otherwise specified in the relevant material specification, conditioning shall be performed according to GMW3221 Code A.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Set the initial distance between the clamps at 25 ± 1 mm.

4.3.2 Select the full-scale force range of the testing machine such that the maximum force occurs between 15% and 85% of the full-scale force.

4.3.3 Set the testing speed to 100 mm/minute ± 5 mm/minute.

4.3.4 Set the appropriate parameters for data collection systems as specified in the manufacturer's instructions.

4.3.5 Secure the test specimen in the machine, clamping along the non-parallel sides of the trapezoid such that the inside corner of one (1) edge of the clamps are in line with the short side of the trapezoid, and the cut is halfway between the clamps. Hold the short edge taut, and let the remaining material lie in folds (Appendix A, Figure A2).