

ASTM D624 Tear Strength of Vulcanized Rubber and Thermoplastic Elastomers (TPE)

TEST METHOD SUMMARY

To properly characterize thermoset rubbers, thermoplastic elastomers and silicones, knowledge of their rupture properties is essential. A common failure of these materials known as tear is a mechanical rupture process that is initiated and propagated at a site of high stress concentration caused by a cut, defect, or a localized deformation. The tears can be further classified as smooth or knotty, and represent a unique characteristic of any particular material. The ASTM D624 test standard outlines the test method procedures for measuring tear strength of conventional vulcanized rubber and thermoplastic elastomers.

In this procedure, a tearing strain (stress) is applied to a test specimen using a universal testing machine operating at a constant rate of crosshead travel until the specimen is completely torn. We know that tear strength is largely influenced by stress-induced anisotropy (also called mechanical fibering), stress distribution, strain rate, and test piece size. Therefore the results obtained in a standard tear strength test should only be regarded as one measure under the conditions of that particular test, and may differ from that material's actual in-service performance.

Solutions for ASTM D624 typically include these types of components;

LOAD FRAME OPTIONS*

Both the premium MTS Criterion® and the economical MTS Exceed® universal testing machines are ideal for testing of vulcanized rubber and thermoplastic elastomers per ASTM D624. These test systems come in a variety of force capacities and frame styles, ranging from 1-column tabletops to larger 2-column floor-standing models. The 30kN and 100kN models also have dual-zone test spaces to reduce set-up times if you frequently change test requirements. And as an alternative to a new load frame, you can modernize the software and controls of your old test system with an MTS ReNew™ Upgrade.



MTS Criterion®
 Electromechanical Universal Test Systems



MTS Exceed®
 Electromechanical Universal Test Systems

GRIP OPTIONS*

			
Pneumatic Grips	Roller Grips	Manual Wedge Grips	Scissors Grips
<ul style="list-style-type: none"> » Vise & Wedge style grips provide constant clamping force to minimize slippage » Most commonly used for qa/qc testing » Many different faces and larger specimen opening for universal testing needs » Fast and easy operation 	<ul style="list-style-type: none"> » Smooth rubber face and smooth compression bar work well for thin films but not for many other applications » Quick and easy to set up » Diamond tip grip faces available for thicker specimens 	<ul style="list-style-type: none"> » Spring loaded mechanical wedge grips are self tightening to minimize grip slippage » Versatile grip for many materials » Interchangeable faces available 	<ul style="list-style-type: none"> » Self-tightening grip limited to certain situations since diamond tip grip faces can damage thin films creating premature break » Good for odd-shaped, non-uniform and thicker plastic specimens

GRIP FACE OPTIONS*

		ASTM D624 Gripping Guidance
<ul style="list-style-type: none"> » Best option for thin or easily damaged specimens 	<ul style="list-style-type: none"> » Can be used for thicker and more durable specimens 	<p>There are five types of tests in this standard. For test Types A,B,C, and CP, the standard specimen widths are 25 mm (1 in). For test Type T the standard specimen width is 30 mm (1.2 in). For all tests, the grip face width should be wider than the specimen under test.</p>

EXTENSOMETRY OPTIONS*

While MTS has a wide variety of extensometers for other tests, extensometry is not required for these tests in accordance with ASTM D624.

SOFTWARE OPTIONS*



ASTM D624 Tear Strength Test Template	About TestSuite™ TW
To simplify testing to ASTM D624, MTS has developed a TestSuite TW test template that will create and report all of the critical tear strength test data prescribed by the standard. There are several specimen types that can be used, including Test Type A, B, C, T, and CP. After selecting your test type, the MTS template will run your test according to recommended test speeds, collect and display tear strength data versus displacement, and do other analysis such as peak and valley, mean force, and total work. MTS consultants are also available to support any of your standard or custom rubber testing applications.	This flexible and versatile software application comes in three versions so that you can choose exactly which one best fits your requirements. Lab managers and test creators like TW Elite since it includes all the test definition capacity and flexibility needed to create and edit custom test sequences while accommodating the specific runtime needs of lab personnel. Test operators prefer the simplicity and intuitive nature of TW Express. This software allows operators to easily execute tests and monitor data or calculated values in runtime views. For QA/QC labs that prefer the MTS Exceed universal test machine, TW Essential will provide both the test creation and test operation capabilities, combining efficiency and productivity in one software application.

APPENDIX - TEST SPECIMEN DETAIL

ASTM D624 Test Type	Description
Type A	Razor-nicked crescent, cut from smaller test specimens that cannot accommodate other test types, measures the maximum force required to cause a nick or cut in this nicked crescent test piece to grow by tearing the rubber, divided by the thickness of the test piece
Type B	Razor-nicked crescent with tab ends, measures the tear propagation, (preferred over A), determines the maximum force required to cause a nick or cut in a nicked tab end test piece to grow by tearing the rubber, divided by the thickness of the test piece
Type C	Unnicked 90 degree angle with tab ends, measures rupture or tear initiative strength, determines the maximum force required to cause a rupture of a right angle test piece, divided by the thickness of the test piece
Type T	Measures tear propagation, determines the mean or median force required to propagate a tear in a trouser test piece, divided by the thickness of the test piece
Type CP	Constrained Path, measures tear propagation but eliminates influence of leg extension that may occur in Type T, determines the mean or median force required to propagate a tear in a constrained path test piece, divided by the thickness of the torn section

*NOTE: This technical note is intended to show some of the popular and more common solutions used for this particular application. Most of the time, additional options are available and necessary to accomplish your more comprehensive test objectives.



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