ASTM D882 Tensile Properties of Thin Film / Plastic Sheeting

TEST METHOD SUMMARY

To properly identify and characterize plastic films and thin sheeting materials for both control and specification purposes, ASTM D882 is one of the more widely used test methods in the industry. This tensile test is similar to ASTM D638 but is specifically for materials that are less than 1mm (0.04") thick. These tensile tests are used to measure elongation, tensile modulus, tensile yield strength, and tensile strength at break. This important test is used in many ways, from specifying a new material for a packaging application, to designing a new part that will withstand a known application force, to performing routine quality control checks of incoming raw materials. Knowing that the physical properties of many of these materials are quite sensitive to varying temperatures, it may be necessary to test the materials at the temperatures that simulate their intended use conditions.

In this procedure, place rectangular strips of film in the grips of the universal test machine and pull until failure. Proper gripping of these fragile specimens is often the biggest challenge to collecting reliable data. The grips must secure the specimen firmly enough to prevent slipping but at the same time not induce local stresses that cause tearing and premature failure. This test method is similar to ISO 527-3, but technically not equivalent since ISO 527-3 allows for additional specimen configurations, specifies different test speeds, and requires an extensometer or gage marks on the specimen.

Solutions for ASTM D882 typically include these types of components;

MTS Criterion®
Electromechanical Universal Test Systems

MTS Exceed®
Electromechanical Universal Test Systems

LOAD FRAME OPTIONS*

Both the premium MTS Criterion® and the economical MTS Exceed® universal testing machines are ideal for testing of thin films and plastic sheeting per ASTM D882. 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.

GRIP OPTIONS*

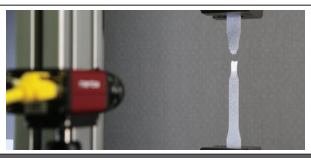
		
Pneumatic Grips	**Manual Vise Grips**	**Roller Grips**
» Vise & Wedge style grips provide constant clamping force to minimize slippage » Most commonly used for qa/qc testing » Many different faces and larger specimen opening for universal testing needs » Fast and easy operation	» Will need to review specimen width and capacity for proper vice grip selection	» Smoother rubber face and smooth compression bar work well for thin films but not for many other applications » Quick and easy to set up

GRIP FACE OPTIONS*

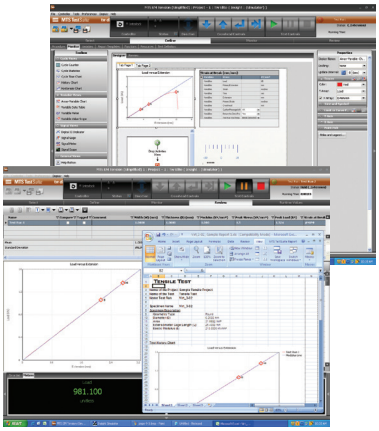
		**ASTM D882 Gripping Guidance**
Flat Rubber Grip Faces	**Line Contact Grip Faces**	The grips must secure the specimen enough to not allow any slipping but at the same time not induce local stresses that cause tearing and premature failure. For all tests, the grip face width should be wider than the specimen under test.
» Best option for thin or easily damaged specimens	» Sometimes a combination of rubber coated faces and line contact faces work best	

EXTENSOMETRY OPTIONS*

The stress strain curves for thin films may contain a linear elastic region, as well as a large non-linear plastic region. Total elongation is best measured with an extensometer. The fragility of the thin film sample requires an extensometer with a low tracking force or even a non-contacting extensometer.

	
Contacting - High Elongation	**Non-contacting - Video**
MTS Advantage™ AHX850 High Elongation Extensometer has an adjustable, low-impact specimen contact force that can be used for most thin film and plastic sheeting materials.	MTS Advantage Video Extensometer (AVX) delivers the highest quality in non-contact strain measurement.

SOFTWARE OPTIONS*



ASTM D882 Tensile Strength Test Template	About TestSuite™ TW
To simplify testing to ASTM D882, MTS has developed a TestSuite™ TW test template that will perform the necessary stress-strain curve toe compensation and then report critical test data such as breaking factor, tensile strength, percent elongation, elastic modulus, tensile energy, and more. MTS consultants are also available to support any of your plastic thin film / sheeting test applications, test method set-up, and data collection and integration requirements.	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.

*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.

APPENDIX - TEST SPECIMEN DETAIL

ASTM D882 Test Specimen Requirements	
Uniformity	Test specimens shall consist of strips of uniform width and thickness at least 50 mm (2 in) longer than the grip separation used.
Width	Nominal width of the specimens shall be not less than 5.0 mm (0.20 in) or greater than 25.4 mm (1.0 in).
Width-thickness Ratio	A width-thickness ratio of at least eight shall be used. Narrow specimens magnify effects of edge strains or flaws, or both.
Undamaged Specimens	Care shall be exercised in cutting specimens to prevent nicks and tears that cause premature failures. Edges shall be parallel to within 5 % of the width over the length of the specimen between the grips.
Consistent Thickness	Test specimens shall be uniform thickness to within 10 % of the thickness over the length of the specimen between the grips for specimen thickness of 0.25 mm (0.010 in) or less, and to within 5 % in the case of specimens greater than 0.25 mm (0.010 in) in thickness.
Anistropic Material	For anisotropic materials, two sets of test specimens shall be prepared having their long axes respectively parallel with and normal to the suspected direction of anisotropy.
Tensile Modulus	For determining tensile modulus of elasticity, a specimen gage length of 250 mm (10 in) is considered standard. This length minimizes the effects of grip slippage on test results. When this length is not feasible, test sections as short as 100 mm (4 in) can be used if test results are not appreciably affected.

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