ASTM D882 â€“ Tensile Testing of Plastic Films and Thin Sheeting â€“ Testing Equipment

Description

Complete Technical Guide to Test Method, Equipment Requirements, Specimen Preparation and Test Procedure

ASTM D882 is a standard test method for determining the tensile properties of plastics in the form of thin sheeting and films. The method is specifically applicable to plastic materials having a thickness of less than 1.0 mm (0.040 in.).

For plastic materials with a thickness of 1.0 mm or greater, ASTM D638 should normally be used instead of ASTM D882.

ASTM D882 is widely used for quality control, material characterization, product development, specification verification and engineering evaluation of flexible plastic films.

Typical applications include:

- PE Film
- LDPE Film
- LLDPE Film
- HDPE Film
- PP Film
- PET Film
- Shrink Film
- Stretch Film
- Packaging Film
- Plastic Bags
- Flexible Plastic Sheeting
- Multilayer Polymer Films

ASTM D882 testing can be used to determine several important mechanical properties, including:

- Tensile Strength
- Tensile Strength at Break
- Tensile Yield Strength
- Elongation at Yield
- Elongation at Break
- Elastic Modulus
- Secant Modulus

- Breaking Factor
- Tensile Energy to Break (TEB)

Reliable ASTM D882 testing requires careful control of specimen preparation, specimen dimensions, film thickness, specimen orientation, grip design, initial grip separation, crosshead speed, extension measurement and environmental conditioning.

Why ASTM D882 Testing Is Important

Tensile properties determined according to ASTM D882 are useful for identification and characterization of plastic films and for quality control and specification purposes.

The measured tensile properties can vary depending on:

- Specimen thickness
- Specimen preparation method
- Test speed
- Grip type
- Grip surface
- Extension measurement method

These parameters must therefore be carefully controlled when accurate comparisons between materials, production batches or laboratories are required.

The tensile modulus of elasticity provides an indication of the stiffness of thin plastic sheeting.

Tensile Energy to Break, or TEB, represents the total energy absorbed by the specimen per unit volume up to the point of rupture.

ASTM D882 Tensile Testing Machine Requirements

The tensile testing machine used for ASTM D882 shall operate using a constant rate of crosshead movement.

The basic system consists of:

- A fixed member carrying one grip
- A movable member carrying the second grip
- A controlled drive mechanism
- A force measurement system
- A crosshead displacement measurement system
- Suitable film tensile grips

- Data acquisition and analysis system

A modern servo-controlled electromechanical tensile testing machine is particularly suitable for ASTM D882 because it allows accurate control of crosshead speed over the wide speed range required for different film elongation categories.

Force Measurement System

The testing machine must include a suitable load-indicating system capable of measuring the total tensile load carried by the specimen.

The required force measurement accuracy is: **Â±1% of the indicated value or better**

The accuracy of the force measurement system should be verified according to ASTM E4.

Thin plastic films normally generate considerably lower tensile forces than rigid plastic specimens.

For this reason, selecting an appropriate load cell is important.

Using an unnecessarily high-capacity load cell can reduce the practical measurement resolution for low-force specimens.

A tensile tester intended for film applications should therefore preferably support interchangeable load cells.

Typical practical load-cell capacities may include:

- 50 N
- 100 N
- 250 N
- 500 N
- 1 kN

The exact load-cell capacity should be selected according to:

- Film thickness
- Specimen width
- Material tensile strength
- Expected maximum breaking force

ASTM D882 requires selection of the load range so that specimen failure occurs within the upper two-thirds of the selected measuring range.

Crosshead Displacement Measurement

The testing machine shall include a suitable mechanism for measuring the change in separation between the grips.

The crosshead extension indication system should provide an accuracy of: **Â±1% of the indicated value or better**

ASTM D882 permits specimen extension to be determined using:

- Grip separation
- Extension indicators
- Displacement of gage marks
- Extensometer measurement

For many routine tensile strength and elongation tests, grip separation can therefore be used as the extension measurement.

Extensometer Requirements

An extensometer is optional under ASTM D882 and is not mandatory for every tensile test.

For modulus determination and low-extension measurements below 20% elongation, an extensometer should:

- Have an accuracy of Â±1% or better
- Meet at least ASTM E83 Class C requirements

For high-extension measurements of 20% elongation or greater, the extension measurement technique should provide an accuracy of: **Â±10% of the indicated value or better**

Video Extensometer for Plastic Films

A non-contact video extensometer can be particularly useful for applications requiring precise strain measurement without mechanically contacting the specimen.

Typical applications include:

- Very thin films
- Highly extensible PE films
- Stretch films
- Precise modulus determination
- Research and development applications

A video extensometer should be considered an optional advanced configuration and is not mandatory for every ASTM D882 test.

ASTM D882 Film Grip Requirements

Grip design is one of the most important factors in successful tensile testing of thin plastic films.

ASTM D882 permits the use of:

- Fixed grips
- Self-aligning grips

The gripping system should minimize:

- Specimen slippage
- Uneven stress distribution
- Specimen misalignment
- Premature failure at the grip
- Damage caused by excessive gripping pressure

The longitudinal axis of the specimen should be aligned as accurately as possible with the direction of tensile loading.

Grip Surface

Suitable grip surfaces may include:

- Thin rubber
- Crocus cloth
- Emery cloth
- Pressure-sensitive tape
- File-faced surfaces
- Serrated surfaces
- Line grips

The optimum grip surface depends on the film material, thickness and mechanical behavior.

The objective is to provide sufficient friction to prevent specimen slippage without damaging the film.

Pneumatic Film Grips

Air-actuated or pneumatic grips can be advantageous for some plastic films, particularly materials that tend to neck into the grips during tensile testing.

Pneumatic grips can provide:

- Consistent gripping pressure
- Reduced operator influence
- Improved repeatability
- Reduced specimen slippage
- Easier specimen installation

Grip pressure should nevertheless be carefully adjusted.

Excessive gripping pressure can damage a thin specimen and cause premature failure, while insufficient pressure may allow the specimen to slip.

ASTM D882 Specimen Dimensions

ASTM D882 uses strip-shaped specimens having uniform width and thickness. The specimen shall be at least: **50 mm longer than the selected initial grip separation**

The nominal specimen width shall be between:

Minimum: 5.0 mm

Maximum: 25.4 mm

The width-to-thickness ratio shall be at least: **8:1**

The specimen edges must be smooth and free from:

- Nicks
- Tears
- Cuts
- Local edge damage

The specimen edges should remain parallel within 5% of the specimen width over the section located between the grips.

Film Specimen Cutting

Specimen preparation is one of the most important factors affecting the repeatability of ASTM D882 test results.

ASTM D882 refers to ASTM D6287 for apparatus and techniques used for cutting film and sheeting specimens.

Razor-blade cutting systems are particularly suitable for materials having elongation at fracture above approximately 10 to 20%.

A precision film specimen cutter should preferably provide:

- Parallel specimen edges
- Repeatable specimen width
- Clean cutting
- Minimum edge damage
- Minimum specimen distortion
- Reduced operator influence

Punch presses and striking dies are not recommended because they may produce poor and inconsistent specimen edges.

A simple cutting template used with a single razor blade is also not recommended where the method adversely affects specimen parallelism.

Film Thickness Measurement

Accurate film thickness measurement is essential because tensile stress calculations depend on the original cross-sectional area of the specimen.

ASTM D882 refers to an appropriate dead-weight dial or digital micrometer according to ASTM D5947 or ASTM D6988, as applicable.

For specimens below 0.25 mm thickness: **Required Thickness Measurement Accuracy: 0.0025 mm or better**

For specimens greater than 0.25 mm but less than 1.0 mm: **Required Thickness Measurement Accuracy: 1% or better**

The specimen cross-sectional dimensions should be measured at appropriate locations before testing.

Specimen Width Measurement

A suitable width-measuring device should be capable of measuring specimen width to: **0.25 mm or better**

Accurate width and thickness measurements are required for determination of the original cross-sectional area.

Specimen Thickness Uniformity

For specimens having a thickness of 0.25 mm or less: **Thickness variation should not exceed 10%**

For specimens greater than 0.25 mm but less than 1.0 mm: **Thickness variation should not exceed 5%**

Excessive thickness variation can result in tensile values that are not representative of the material.

Machine Direction and Transverse Direction

Plastic films can exhibit anisotropic mechanical properties because of extrusion, blowing, stretching or orientation during manufacturing.

When anisotropy is suspected, specimens should be tested in two principal directions: **MD â€“ Machine Direction**

and: **TD â€“ Transverse Direction**

Testing both directions is particularly important for:

- Shrink film
- Blown PE film
- Packaging film
- Oriented film
- Multilayer film

Tensile strength, modulus and elongation can differ significantly between MD and TD.

ASTM D882 Conditioning Requirements

Unless otherwise specified by the applicable material specification or agreement, specimens should be conditioned before testing.

Standard conditioning conditions are: **Temperature: 23 Â± 2Â°C**

Relative Humidity: 50 Â± 10%

Minimum Conditioning Time: 40 hours

Testing should normally also be performed at: **23 Â± 2Â°C**

and: **50 Â± 10% Relative Humidity**

Environmental conditions should therefore be controlled when reliable comparisons between production batches, materials or laboratories are required.

Number of Test Specimens

For isotropic materials: **At least 5 specimens should be tested from each sample.**

For anisotropic materials: **At least 10 specimens should be tested.**

This normally consists of: **5 specimens parallel to the principal material direction**

and: **5 specimens normal to the principal material direction**

Under the reduced-specimen option permitted by ASTM D882 in specified circumstances, no fewer than 3 specimens may be tested.

For anisotropic materials under the reduced option, no fewer than 6 specimens are required:

- 3 parallel
- 3 normal

The reduced number should be identified in the report, and standard deviation should not be calculated from the reduced data set.

ASTM D882 Test Speeds and Initial Grip Separation

Correct selection of initial grip separation and crosshead speed is one of the most important requirements of ASTM D882.

The required conditions depend on the property being measured and the expected elongation of the material.

Test Condition	Initial Strain Rate	Initial Grip Separation	Crosshead Speed
Elastic Modulus	0.1 mm/mmÂ·min	250 mm	25 mm/min
Elongation Less Than 20%	0.1 mm/mmÂ·min	125 mm	12.5 mm/min
Elongation 20â€“100%	0.5 mm/mmÂ·min	100 mm	50 mm/min
Elongation Greater Than 100%	10.0 mm/mmÂ·min	50 mm	500 mm/min

A tensile testing machine intended to cover the full ASTM D882 test range should therefore be capable of accurately operating at least at:

- 12.5 mm/min
- 25 mm/min
- 50 mm/min
- 500 mm/min

A wider programmable speed range can provide additional flexibility for other tensile testing standards and applications.

Calculation of ASTM D882 Crosshead Speed

ASTM D882 defines the relationship between initial strain rate, initial grip separation and crosshead speed as: **A = B Ã— C**

Where:

A = Rate of grip separation, mm/min

B = Initial distance between grips, mm

C = Initial strain rate, mm/mmÂ·min

For example, for a highly extensible film:

Initial Grip Separation = 50 mm

Initial Strain Rate = 10 mm/mmÂ·min

Therefore: **A = 50 Ã— 10**

and: **Crosshead Speed = 500 mm/min**

Importance of Initial Grip Separation

Correct initial grip separation is critical because an incorrect setting directly affects:

- Calculated elongation
- Initial strain rate
- Test repeatability
- Comparison between specimens

ASTM D882 provides specific guidance for determining initial grip separation for different grip configurations.

The actual specimen contact points of the grips should be considered when establishing the initial distance.

Elastic Modulus Testing

For determination of tensile modulus of elasticity, ASTM D882 specifies a standard gage length of: **250 mm**

The relatively long gage length helps minimize the effect of grip slippage on the measured modulus.

Where a 250 mm test section is not feasible, test sections as short as: **100 mm**

may be used if it can be demonstrated that the shorter test section does not appreciably affect the results.

For referee purposes: **250 mm should be used.**

For the standard modulus configuration:

Initial Grip Separation: 250 mm

Initial Strain Rate: 0.1 mm/mmÂ·min

Crosshead Speed: 25 mm/min

When a shorter test section is used, crosshead speed should be adjusted to maintain the required strain rate.

ASTM D882 Step-by-Step Test Procedure

Step 1 â€“ Identify the Film Sample

Identify:

- Material type
- Product designation
- Film thickness
- Production batch
- Specimen orientation

For anisotropic films, clearly identify MD and TD directions.

Step 2 â€“ Prepare the Test Specimens

Cut the film into uniform strip specimens.

The specimen width should be between: **5.0 and 25.4 mm**

Ensure that:

- Edges are smooth
- Edges are parallel
- No nicks are present
- No tears are present
- The specimen has not been stretched or damaged during cutting

Step 3 â€“ Condition the Specimens

Condition the specimens for at least: **40 hours**

at: **23 Â± 2Â°C**

and: **50 Â± 10% RH**

unless another condition is specified by the applicable material specification or agreement.

Step 4 â€“ Measure Specimen Dimensions

Measure the specimen dimensions before testing.

Record:

- Width
- Thickness

These dimensions are required for calculation of tensile stress.

Step 5 â€“ Select the Correct Load Cell and Load Range

Estimate the expected breaking force.

Select a load cell and measuring range so that specimen failure occurs within the upper two-thirds of the selected load range.

Preliminary tests may be performed when the expected breaking force is unknown.

Step 6 â€“ Select Initial Grip Separation

Select the initial grip separation according to the expected elongation or required property.

Typical values are:

250 mm â€“ Elastic Modulus

125 mm â€“ Elongation Below 20%

100 mm â€“ Elongation Between 20 and 100%

50 mm â€“ Elongation Greater Than 100%

Step 7 â€“ Set Crosshead Speed

Set the crosshead speed according to the applicable ASTM D882 condition.

Typical values are:

25 mm/min â€“ Elastic Modulus

12.5 mm/min â€“ Elongation Below 20%

50 mm/min â€“ Elongation Between 20 and 100%

500 mm/min â€“ Elongation Greater Than 100%

Step 8 â€“ Zero the Measurement Systems

Before starting the test, zero the calibrated:

- Force measurement system
- Crosshead displacement measurement
- Extensometer, when used
- Data acquisition system

Step 9 â€“ Install the Specimen

Place the specimen between the grips.

The longitudinal axis of the specimen should coincide with the tensile loading direction.

Avoid:

- Twisting
- Angular installation
- Initial slack

- Uneven gripping

Step 10 â€“ Clamp the Specimen

Tighten the grips evenly and firmly.

The gripping force should be sufficient to prevent specimen slippage without damaging the film.

For pneumatic grips, use a suitable and repeatable gripping pressure.

Step 11 â€“ Start the Test

Start the tensile testing machine.

Continuously record:

Load versus Extension

or, when appropriate strain measurement is available:

Stress versus Strain

Step 12 â€“ Continue to the Required Endpoint

Depending on the required property, testing may continue until:

- Yield
- Specified strain
- End of modulus measurement
- Final specimen rupture

For modulus determination, testing may be stopped after sufficient data have been collected from the initial linear portion of the curve.

Tensile Strength Calculation

Nominal tensile strength is calculated as: **Tensile Strength = Maximum Load / Original Minimum Cross-Sectional Area**

The result is normally reported in: **MPa**

The maximum load can occur:

- At yield

- At break
- Between yield and break

depending on the mechanical behavior of the material.

Tensile Strength at Break

Tensile strength at break is calculated using:

Tensile Strength at Break = Load at Break / Original Minimum Cross-Sectional Area

Tensile strength and tensile strength at break can be identical for some films.

However, they are not necessarily the same.

Films showing yielding followed by further deformation or strain hardening may exhibit a maximum load that differs from the load recorded at final rupture.

Elongation at Break

Percent elongation at break is calculated as:

Elongation at Break (%) = Extension at Rupture / Initial Gage Length Ã— 100

When an extensometer or gage marks define a specific test section, that gage length should be used.

Otherwise, the initial grip separation is used as the reference length.

Tensile Yield Strength

Where a distinct yield point exists:

Tensile Yield Strength = Load at Yield / Original Minimum Cross-Sectional Area

The result is normally reported in: **MPa**

Elongation at Yield

Percent elongation at yield is calculated as: **Elongation at Yield (%) = Extension at Yield / Initial Gage Length Ã— 100**

Toe compensation should be applied where necessary before calculating strain-related properties.

Elastic Modulus

Elastic modulus represents the tensile stiffness of the film.

It is determined from the initial linear portion of the stress-strain curve.

Conceptually: **Elastic Modulus = Tensile Stress / Corresponding Strain**

Accurate modulus determination requires particular attention to:

- Initial gage length
- Specimen alignment
- Grip slippage
- Extension measurement accuracy
- Force measurement accuracy
- Data acquisition
- Toe compensation

Toe Compensation

The beginning of a tensile curve may contain an artificial region caused by:

- Initial specimen slack
- Grip seating
- Specimen seating
- Alignment effects

This initial region is commonly referred to as the toe region.

If the toe is caused by the test setup rather than the actual material behavior, appropriate toe compensation should be applied.

Toe compensation is particularly important for determining:

- Elastic modulus
- Strain
- Elongation
- Offset yield values

Secant Modulus

Some plastic films may not exhibit a clearly defined linear stress-strain region.

In such cases, a secant modulus may be determined at a specified strain.

When secant modulus is reported, the strain used for its determination should also be specified.

Tensile Energy to Break â€“ TEB

Tensile Energy to Break represents the total energy absorbed by the specimen up to rupture.

It corresponds to the area under the stress-strain curve.

TEB is normally expressed as energy per unit original specimen volume, typically: **MJ/mÂ³**

A computerized tensile testing system can calculate TEB automatically by numerical integration of the stress-strain curve.

Breaking Factor

Breaking factor is another property that can be determined according to ASTM D882.

It is calculated using the maximum tensile load and the original minimum specimen width.

Conceptually: **Breaking Factor = Maximum Load / Original Minimum Specimen Width**

This property can be useful where comparison based on specimen width is more appropriate than calculation based on cross-sectional area.

Abnormal Specimen Failure

Not every specimen rupture should automatically be accepted as a valid result.

Special attention should be given to specimens that:

- Slip inside the grips
- Break because of an obvious specimen defect
- Tear instead of failing normally
- Fail abnormally close to the grips
- Show evidence of cutting damage

Materials that fail by tearing can produce anomalous results that should not be directly compared with normal tensile failures.

Grip-area failures should also be carefully evaluated to determine whether the gripping system has influenced the result.

Recommended ASTM D882 Tensile Tester Technical Specifications

The following configuration represents a practical laboratory solution for comprehensive thin-film tensile testing.

Parameter	Requirement / Recommended Configuration
Test Standard	ASTM D882
Application	Plastic films and thin plastic sheeting
Applicable Thickness	Less than 1.0 mm
Machine Type	Constant-rate-of-crosshead-movement tensile tester
Recommended Drive	Servo-controlled electromechanical system
Specimen Type	Rectangular strip
Specimen Width	5.0â€“25.4 mm
Width/Thickness Ratio	Minimum 8:1
Force Accuracy	Â±1% of indicated value or better
Force Verification	ASTM E4
Crosshead Displacement Accuracy	Â±1% of indicated value or better
Modulus Grip Separation	250 mm
Modulus Speed	25 mm/min
Below 20% Elongation	125 mm / 12.5 mm/min
20â€“100% Elongation	100 mm / 50 mm/min
Above 100% Elongation	50 mm / 500 mm/min
Grip Type	Fixed or self-aligning
Recommended Film Grip	Pneumatic or suitable anti-slip film grips
Extensometer	Optional
Low-Strain Extensometer	ASTM E83 Class C minimum where applicable
Conditioning Temperature	23 Â± 2Â°C
Relative Humidity	50 Â± 10%
Conditioning Time	Minimum 40 hours
Isotropic Specimen Count	Minimum 5
Anisotropic Specimen Count	5 parallel + 5 normal
Thickness Measurement	ASTM D5947/D6988 as applicable
Specimen Preparation	ASTM D6287 reference
Primary Test Data	Load vs. Extension
Recommended Analysis	Stress-Strain Curve and Automatic Calculations

Recommended Complete ASTM D882 Laboratory Configuration

A complete ASTM D882 laboratory setup should not be considered only as a tensile testing machine.

The complete test system should include the following equipment.

1. Computer-Controlled Tensile Testing Machine

Recommended characteristics:

- Servo-controlled electromechanical drive
- Constant-rate crosshead movement
- Programmable test speed
- Digital force measurement
- Digital displacement measurement
- Interchangeable load cells
- Computerized test control
- Automatic calculations
- Test report generation

2. Film Tensile Grips

Recommended characteristics:

- Suitable for thin plastic films
- Anti-slip grip surfaces
- Good specimen alignment
- Adjustable clamping force
- Minimum specimen damage

Optional configuration:

Pneumatic Film Grips

3. Precision Film Specimen Cutter

The specimen cutter should produce:

- Accurate specimen width
- Parallel edges
- Clean edges
- Minimum cutting damage
- Repeatable specimen geometry

4. Film Thickness Gauge

A suitable film thickness gauge is required for accurate determination of specimen thickness before tensile testing.

The measurement system should be selected according to the applicable ASTM D5947 or ASTM D6988 requirements.

5. Specimen Width Measurement Device

A suitable measuring device should be available for determination of specimen width with the required accuracy.

6. Optional Video Extensometer

A video extensometer may be added when high-accuracy non-contact strain measurement is required.

This can be particularly useful for:

- Elastic modulus
- Research applications
- Very thin films
- Highly extensible materials

7. Tensile Testing Software

The software should preferably provide:

- Real-time force measurement
- Real-time displacement measurement
- Load-extension curve
- Stress-strain curve
- Tensile strength calculation
- Tensile strength at break
- Yield strength
- Elongation at yield
- Elongation at break
- Elastic modulus
- Secant modulus
- Breaking factor
- Tensile Energy to Break
- Toe compensation
- Average calculation
- Standard deviation
- Test report generation
- Raw data export

Machine Travel Requirement

ASTM D882 does not specify one universal minimum machine-travel value.

The required usable travel depends on:

- Initial grip separation
- Expected elongation
- Film material
- Required endpoint

This is particularly important for highly extensible materials such as:

- LDPE Film
- LLDPE Film
- Stretch Film
- Flexible PE Film

For films having elongation greater than 100%, ASTM D882 uses an initial grip separation of: **50 mm**

However, some films may elongate several hundred percent before rupture.

The machine must therefore provide sufficient usable crosshead travel to complete the test without reaching its mechanical travel limit.

For a laboratory intended to test a wide range of highly extensible films, a machine with approximately **500 mm or greater usable travel** can be a practical design choice.

This value is an equipment recommendation and should not be interpreted as a fixed minimum travel specified by ASTM D882.

ASTM D882 Test Report

A complete test report should include relevant information such as:

- Material identification
- Material source
- Product designation
- Specimen preparation method
- Specimen dimensions
- Specimen thickness
- Specimen width
- Number of specimens
- Specimen orientation
- Conditioning conditions
- Test temperature

- Relative humidity
- Initial grip separation
- Crosshead speed
- Initial strain rate
- Gage length
- Grip type
- Grip facing
- Extensometer use, where applicable
- Abnormal specimen behavior
- Average breaking factor
- Tensile strength
- Tensile strength at break
- Elongation at break
- Yield strength, where applicable
- Elongation at yield, where applicable
- Elastic modulus or secant modulus
- Tensile Energy to Break, where applicable
- Statistical results where required

The test report should also identify any deviations from the standard test procedure.

ASTM D882 for Shrink Film and Packaging Film

ASTM D882 is particularly useful for mechanical characterization of shrink films and flexible packaging materials.

For these products, testing in both MD and TD directions can provide valuable information about film orientation and production consistency.

Important quality-control parameters can include:

- MD Tensile Strength
- TD Tensile Strength
- MD Elongation at Break
- TD Elongation at Break
- Elastic Modulus
- Tensile Energy to Break

Changes in these properties may indicate variations in:

- Raw material
- Film thickness
- Extrusion conditions
- Orientation
- Cooling conditions
- Production parameters

For this reason, ASTM D882 testing can form an important part of routine quality control in a film production laboratory.

ASTM D882 for Plastic Bags

Plastic bags manufactured from PE, PP or similar flexible polymer films can also be evaluated using ASTM D882 when the film thickness and specimen geometry fall within the scope of the method.

Tensile testing can help evaluate:

- Material consistency
- Tensile strength
- Elongation
- Directional differences
- Production batch consistency
- Effect of raw-material changes

When specimens are taken from finished products, the sampling location and orientation should be kept consistent when comparative quality-control data are required.

ASTM D882 vs ASTM D638

ASTM D882 and ASTM D638 are both tensile testing methods for plastics, but they are intended for different specimen forms and thickness ranges.

ASTM D882 is intended for: **Thin plastic films and sheeting below 1.0 mm thickness**

ASTM D638 is generally used for: **Plastic specimens having a thickness of 1.0 mm or greater**

ASTM D638 commonly uses shaped tensile specimens, while ASTM D882 normally uses rectangular strip specimens.

Therefore, selecting the correct test method depends primarily on the form and thickness of the plastic material being evaluated.

ASTM D882 vs ISO 527-3

ASTM D882 and ISO 527-3 are both used for tensile characterization of plastic films and sheets.

However, they should not be considered technically equivalent.

Differences may exist in areas such as:

- Specimen configurations
- Test speeds
- Strain measurement requirements
- Test procedure

A laboratory should therefore follow the exact standard specified by the customer, product specification or regulatory requirement rather than assuming that results obtained according to ASTM D882 and ISO 527-3 are automatically interchangeable.

Frequently Asked Questions â€“ ASTM D882

What is ASTM D882 used for?

ASTM D882 is used to determine tensile properties of thin plastic films and sheeting.

Typical measured properties include tensile strength, elongation at break, yield strength, modulus and Tensile Energy to Break.

What is the maximum thickness for ASTM D882?

ASTM D882 applies to plastic films and sheeting with a thickness of:

Less than 1.0 mm

Materials having a thickness of 1.0 mm or greater are generally tested according to ASTM D638.

What is the specimen width for ASTM D882?

The nominal specimen width is: **5.0 to 25.4 mm**

The width-to-thickness ratio should be at least 8:1.

What is the test speed for ASTM D882?

The test speed depends on expected elongation and the property being measured.

Typical speeds are:

12.5 mm/min

25 mm/min

50 mm/min

500 mm/min

What is the initial grip separation for ASTM D882?

Typical initial grip separations are:

250 mm for Elastic Modulus

125 mm for elongation below 20%

100 mm for elongation between 20 and 100%

50 mm for elongation greater than 100%

Is an extensometer mandatory for ASTM D882?

No.

ASTM D882 permits extension measurement by grip separation, extension indicators or displacement of gage marks.

An extensometer may be used when greater strain measurement accuracy is required.

Can pneumatic grips be used for ASTM D882?

Yes.

Air-actuated grips can be advantageous for thin films, particularly materials that tend to neck into the grips.

Correct gripping pressure is important to prevent both slippage and specimen damage.

How many specimens are required for ASTM D882?

For isotropic materials:

At least 5 specimens

For anisotropic materials:

At least 10 specimens

normally consisting of:

5 parallel and 5 normal to the principal material direction

What laboratory conditions are required?

Unless otherwise specified:

Temperature: 23 Â± 2Â°C

Relative Humidity: 50 Â± 10%

Conditioning Time: Minimum 40 hours

Can ASTM D882 be used for shrink film?

Yes.

ASTM D882 is commonly applicable to tensile characterization of thin shrink films when the material falls within the thickness range of the standard.

Testing in both MD and TD directions is useful for evaluating directional mechanical properties.

Can ASTM D882 be used for plastic bags?

Yes, when specimens taken from the bag material satisfy the thickness and specimen requirements of ASTM D882.

Consistent sampling location and orientation are important for comparative quality-control testing.

Conclusion

ASTM D882 tensile testing requires much more than simply pulling a strip of plastic film until it breaks.

Reliable results depend on correct control of:

- Machine accuracy
- Load-cell selection
- Crosshead speed
- Initial grip separation
- Grip design
- Specimen preparation
- Film thickness measurement
- Specimen orientation
- Environmental conditioning

- Extension measurement
- Data analysis

For laboratories testing shrink film, packaging film, PE film, PP film, plastic bags and other flexible plastic products, a properly configured computer-controlled tensile testing machine combined with suitable film grips, a precision specimen cutter and accurate dimensional measurement equipment provides a comprehensive solution for ASTM D882 testing.

The applicable product or material specification should always be reviewed together with ASTM D882 because specific product standards may introduce additional requirements or procedural modifications.

Single Column Tensile Compression Tester (UTM)-100 Kg-500mm

Category

1. Equipment for Standards
2. Standards