

## ISO 527-2 Tensile Properties of Moulding and Extrusion Plastics

### TEST METHOD SUMMARY

Tensile testing for moulding and extrusion plastics per ISO 527-2, based upon the general principles given in ISO 527-1, is a popular and extremely important test method. By measuring the force required to pull a test specimen to its breaking point, several material properties can be determined. This data enables both product design engineers and quality managers to accurately predict the performance of their products in end-use applications. This information is critical for developing new products ensuring compliance to industry or government standards, improving manufacturing and reducing production costs.

To perform these tensile tests, the “dumbbell-shaped” test specimens are placed in the grips of a universal testing machine (UTM) and subjected to controlled tension until they fail. Test speeds vary by specimen type to achieve a 1%/min strain rate, and an extensometer is used to measure specimen parameters. The resulting tensile test data is used to report material properties such as stress, strain, tensile modulus and Poisson’s ratio. ISO 527-2 is very similar to ASTM D638, with one key exception being analysis of the non-linear portion of a material’s stress-strain curve. For most plastic materials the test results per the two standards will be similar. But for plastics which have little or no linear region, the variation between ASTM and ISO can be significant. Finally, due to the viscoelastic nature of plastics, these tests can be performed with temperature chambers to better simulate end-use environments.

Solutions for ISO 527-2 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 tensile testing of plastics per ISO 527-2. They both 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\*

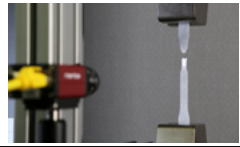

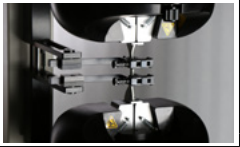

 <b>Pneumatic Grips</b>	 <b>Manual Wedge Grips</b>	 <b>Screw Action Grips</b>
<ul style="list-style-type: none"> <li>» Vise &amp; Wedge style grips provide constant clamping force to minimize slippage</li> <li>» Most commonly used for qa/qc testing</li> <li>» Many different faces and larger specimen opening for universal testing needs</li> <li>» Fast and easy operation</li> </ul>	<ul style="list-style-type: none"> <li>» Spring loaded mechanical wedge grips are self tightening to minimize grip slippage</li> <li>» Versatile grip for many materials</li> <li>» Interchangeable faces available</li> </ul>	<ul style="list-style-type: none"> <li>» Economical manual grip</li> <li>» Many faces, sizes and profiles</li> <li>» Large specimen opening is good for a variety of tests</li> </ul>

### GRIP FACE OPTIONS\*

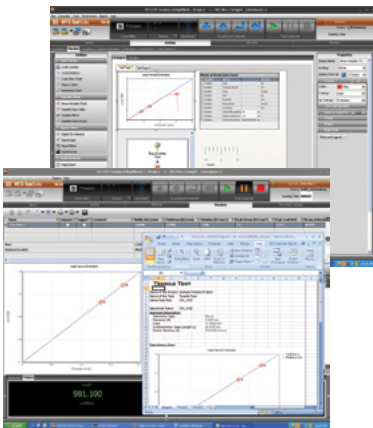
 <b>Serrated Grip Faces</b>	 <b>Diamond Tip Faces</b>	 <b>Flat Rubber Faces</b>	<p style="text-align: center;"><b>ISO 527-2 Gripping Guidance</b></p> <p>The grips must secure the specimen to prevent slipping but at the same time not induce stresses that can lead to misleading failures. The grip faces should be wider than the specimen under test.</p>
<ul style="list-style-type: none"> <li>» Versatile and the most common</li> </ul>	<ul style="list-style-type: none"> <li>» good for thicker, more durable specimens</li> </ul>	<ul style="list-style-type: none"> <li>» Used for thinner, more fragile specimens</li> </ul>	

## EXTENSOMETRY OPTIONS\*

The stress strain curves for plastics usually contain a linear elastic region, as well as a non-linear plastic region. Modulus needs to be measured within the linear elastic portion, where very little strain exists. This is why accuracy is an important factor in determining the right extensometry for your test. Extensometers with high accuracy typically have limited travel and must be removed from the specimen during the test.

			
Video	Auto	High Elongation	Clip-on
MTS Advantage™ Video Extensometer (AVX) delivers the highest quality in non-contact strain measurement.	The MTS MF Automatic Extensometer allows release prior to break and also has an automated gage length set-up.	MTS Advantage AHX850 High Elongation Extensometer has an adjustable, low-impact specimen contact force that is especially good for fragile materials.	MTS Model 634 Series Clip-On Extensometers are good for measuring modulus.

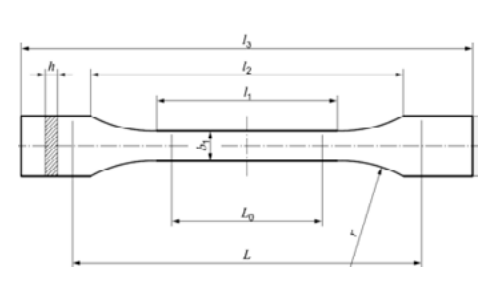
## SOFTWARE OPTIONS\*



ISO 527-2 Tensile Properties of Moulding and Extrusion Plastics Test Template	About TestSuite™ TW
<p>To simplify testing to ISO 527-2, MTS has developed a TestSuite™ TW test template that will set-up and run the recommended tensile tests. After the test data has been collected, reports can display all of the required calculations including tensile strength, elongation at yield, elongation at break, nominal strain at break, modulus of elasticity, secant modulus, Poisson's ratio, and more.</p> <p>MTS consultants are also available to support any of your plastics applications, test method set-up, and data collection and integration requirements.</p>	<p>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.</p>

\*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

Preferred Specimen Shape, Type 1A and Type 1B	Specimen Notes **
	Type 1A is used for directly injection-moulded or compression-moulded specimens.
	Type 1B is used for machined specimens.
	Type C of ISO 20753 is used when many specimens are to be exposed in a limited space.
	Type CW can be used if only the relative change of strength is of interest.
	**Consult ISO standards for test specimen dimensions.



**MTS Systems Corporation**  
 14000 Technology Drive  
 Eden Prairie, MN 55344-2290 USA  
 Telephone: 1-952-937-4000  
 Toll Free: 1-800-328-2255  
 E-mail: info@mts.com  
 www.mts.com

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