ISO 178 Flexural Properties of Plastics

TEST METHOD SUMMARY

Because the flexural properties of plastics are critical in so many applications, ISO 178 is one of the most commonly utilized test methods in the plastics industry. It determines the flexural behaviour of thermoplastics and thermosetting moulding materials, including filled and reinforced compounds, unfilled types, and sheets. Properties that are measured include flexural strength, flexural modulus, and other aspects of the flexural stress/strain relationship. These properties are only used in engineering design if the materials exhibit linear stress/strain behaviour. If not, then the flexural property test results are only nominal.

In this procedure, a test specimen that is supported as a beam is deflected at its midpoint at a constant rate until it either fractures or it reaches a predetermined value of deformation. For anisotropic materials, the flexural stress should be applied in the same or similar direction as that to which the product will be subjected to in service. Conduct the test in the atmosphere specified in the standard for the materials being tested, or refer to ISO 291 to select the proper conditions. ISO 178 is very similar to ASTM D790, except that there can be some variance in specimen dimensions, test speeds, and specimen deflection requirements.

Solutions for ISO 178 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 determining the flexural properties of plastics per ISO 178. 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.

BEND FIXTURE OPTIONS*

Room Temperature Testing

Bend fixtures are generally selected based on the size of the intended test specimen. As examples, the bend fixture on the left is designed for specimens up to 25 mm in width while the bend fixture on the right is suitable for larger specimens, up to 45 mm (1.8 in) in width.

Temperature Testing

Flexural testing of plastics is often performed at the temperatures that are expected during the end-use applications. As examples, the bend fixture on the left is rated at -50° C to 150° C (-58° F to 302° F) and the bend fixture on the right is rated at -129°C to 177°C (-200°F to 350°F).

EXTENSOMETRY OPTIONS*

632.06 Displacement Gage

The versatile 632.06 displacement gage extensometer is ideal for testing plastics and composites according to ISO 178. It is designed for use where small deformations must be measured and it is protected from overtravel in all directions. The gage arm releases in either a positive or negative overtravel situation or when a side load is applied. This unit also comes with an adjustable mounting block. When properly positioned, the unit can be locked in place.

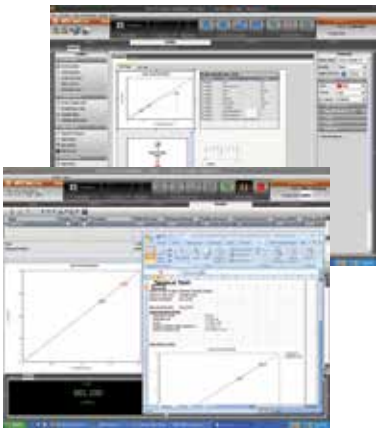
Non-contacting - Video

MTS Advantage™ Video Extensometer (AVX) delivers the highest quality in non-contact strain measurement.

CHAMBER OPTIONS*

	
Advantage Environmental Chamber	**FEC 1200 or 1300**
The Advantage™ Environmental Chamber designed for Criterion load frames is ideal for testing of elastomeric components, tire cords, plastics, composites, and laminates. It has a temperature range from -129° C to 315° C (-200°F to 600°F), and is compatible with either video or laser extensometers.	The Fundamental™ Environmental Chamber designed for Exceed load frames is also ideal for testing these same thermoplastic and composite materials. It has a temperature range from -70°C to 350°C (-94°F to 662°F) and is likewise compatible with either video or laser extensometers.

SOFTWARE OPTIONS*



ISO 178 Flexural Properties Test Template	About TestSuite™ TW
To simplify testing to ISO 178, MTS has developed a TestSuite™ TW test template that will set up and run the recommended flexural tests. After the test data has been collected, reports can display all of the required calculations including flexural stress, flexural strain, flexural modulus, 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

Size	Preparation
The preferred specimen dimensions are length (L) of 80 mm, width of 10,0 mm and thickness (T) of 4,0 mm. When this specimen sizing is not possible or practical, keep the length and thickness of the new specimen size in the same ratio as the preferred specimen. In this regard, the ratio of L/T = 20 should be maintained.	**Moulded and Extruded Compounds**
	Prepare according to relevant material specification, or in absence thereof, refer to ISO 293, ISO 294-1, ISO 295 or ISO 10724-1.
	Sheets
	Prepare according to ISO 2818.

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ISO 9001 Certified QMS

100-332-872 TMTNI178 Printed in U.S.A. 0921