

ASTM D3410 Compressive Properties of Polymer Matrix Composite Materials with Unsupported Gage Section by Shear Loading

TEST METHOD SUMMARY

Compression testing of fibre-reinforced composites per ASTM D3410, is used to determine mechanical material property data that are of interest for design specification and quality control.

Uniaxial compression force is applied to a rectangular test specimen held in a compression loading fixture to investigate the stress/strain behavior and critical materials properties including compression modulus, compression strength and compressive failure strain. The loading fixture provides a compressive force into the specimen through shear at the wedge grip interfaces. The standard addresses composite material that are reinforced by of continuous or discontinuous fibers for which the elastic properties are specially orthotropic with respect to the test direction.

The compression test is performed by placing the loading fixture with the test specimen between compression platens of either a servohydraulic or an electromechanical testing machine and subjecting the specimen to controlled compression load until failure. The specimen response can be measured with an extensometer on the edges or strain gauges on both faces of the specimen.

Solutions for ASTM D3410 typically include these types of components:

LOAD FRAME OPTIONS*

The MTS Landmark servohydraulic test systems and MTS Criterion electromechanical universal test systems are ideal for performing accurate and repeatable monotonic testing of polymer matrix composites per ASTM D3410.

The MTS Landmark innovative test frame design exhibits superior stiffness and alignment capabilities. The test system integrates the latest MTS servohydraulic technology including precision-machined columns for consistently tight alignment, fatigue-rated MTS actuators with low friction bearings, smooth-ramping hydraulic service manifolds, and SilentFlo™ hydraulic power units are quiet enough to be located directly in the laboratory.

The compact MTS Criterion test system features high-resolution MTS digital controls, linear motion guides for superior alignment, high-speed, low vibration MTS electromechanical drives, optional Dual Zone test space for maximizing efficiency.



CHAMBER OPTIONS*



MTS Landmark®
Servohydraulic Test Systems



MTS Criterion®
Electromechanical Universal Test Systems

| | |
|---|---|
|  |  |
| <p align="center">MTS Series 651 Environmental Chambers</p> | <p align="center">MTS Advantage™ Environmental Chamber</p> |
| <ul style="list-style-type: none"> » Temperature range of -150°C to 540°C (-240°F to 1000°F) » Designed for MTS Landmark systems » Compatible with video extensometers | <ul style="list-style-type: none"> » Temperature range of -129°C to 315°C (-200°F to 600°F) » Designed for MTS Criterion systems » Compatible with video extensometers |

FIXTURE OPTIONS*

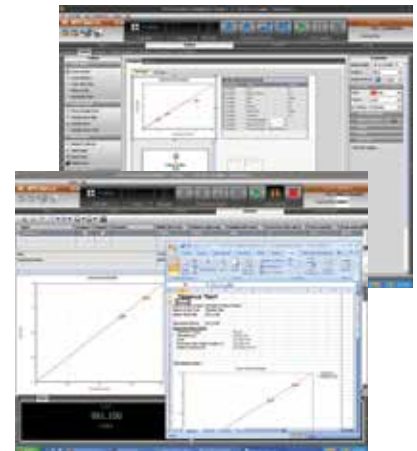


ASTM D3410 IITRI Shear-Loading Compression Fixture

- » Recommended to test in accordance with ASTM D3410
- » Constructed out of high quality stainless steel
- » Supplied with one set of replaceable loading wedges to accommodate specimen thickness from 5.1 to 10.2 mm
- » Each fixture comes with an alignment jig for proper assembly of the specimen grip assembly
- » Static Force Rating: 250 kN (55 kip)
- » Temperature range of -85°C to 122°C (-120°F to 250°F)

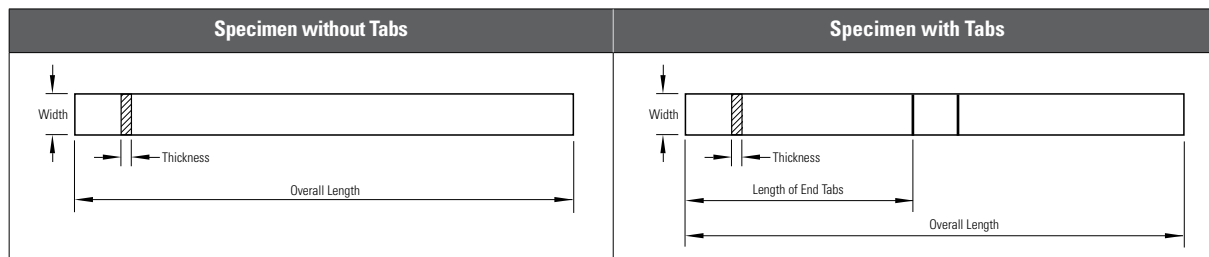
SOFTWARE OPTIONS*

| ASTM D3410 Compression Properties of Polymer Matrix Composite Materials | About MTS TestSuite™ TW |
|---|---|
| <p>MTS has developed generic composite compression TestSuite™ TW test templates that can easily be modified to be in compliance with ASTM D3410 requirements.</p> <p>The templates can support the use of strain gages or extensometers for strain measurement. Reports can display all of the required calculations including stress-strain plot, compression modulus, compression strength, compressive failure strain.</p> <p>MTS consultants are also available to support your composite applications, test method set-up, and data collection and integration requirements.</p> | <p>The efficient MTS TestSuite TW software provides the versatility required to address unique and complex testing requirements.</p> <p>twe TestSuite TW Elite includes all the test definition capacity and flexibility test designers need to create and edit custom test sequences while accommodating the specific runtime needs of lab personnel.</p> <p>twx TW Express is designed for the test operator and is used to run tests created with TW Elite. This application allows the operator to easily execute even the most complex tests and monitor data or calculated values in runtime views that can be tailored by both test designers and operators.</p> |



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

APPENDIX - TEST SPECIMEN DETAIL



| Dimension | Fiber Orientation 0°, Unidirectional | Fiber Orientation 90°, Unidirectional | Fiber Orientation, Specially Orthotropic |
|------------------------------------|--------------------------------------|---------------------------------------|--|
| Overall length in mm | 140 - 155 | | |
| Minimum required thickness*1 in mm | 1 - 4.36 | 1 - 8.72 | 1 - 10.91 |
| Width in mm | 10 | 25 | 25 |
| Tab length in mm | 65 | 65 | 65 |
| Gage length in mm | 10 - 25 | | |
| Thickness of end tabs in mm | 1.5 | | |

*NOTE: *1 Refer to ASTM D3410 standard for detailed recommendations on minimum required specimen thickness.



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