ISO 527-5 Tensile Properties of Unidirectional Fibre-Reinforced Plastic Composites

**TEST METHOD SUMMARY**

Tensile testing of unidirectional fibre-reinforced composites per ISO 527-5, is used to determine mechanical material property data. Uniaxial tensile force is applied to a flat test specimen to investigate the stress/strain behavior and critical materials properties including tensile modulus, tensile strength, elongation at break, and Poisson’s ratio. Composite materials addressed by the standard include unidirectional fibre-reinforced thermosetting and thermoplastic which include glass fibres, carbon fibres, and aramid fibres as reinforcement.

The tensile test is performed by placing a test specimen in the grips of either a servohydraulic or an electromechanical testing machine and subjecting it to controlled tension load until failure. The specimen response can be measured with a contacting or non-contacting extensometer, or strain gages.

ISO 527-4 is another commonly used standard for tensile testing of non-unidirectional fibre-reinforced composites.

Solutions for ISO 527-5 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 fibre-reinforced plastics per ISO 527-5.

The MTS Landmark system’s 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 that 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 and anti-rotation grip/fixture mounting to minimize shear stresses on the specimen.

**CHAMBER OPTIONS**

**MTS Series 651 Environmental Chamber**
- Temperature range of -150°C to 540°C (-240°F to 1000°F)
- Designed for MTS Landmark systems
- Compatible with video extensometers

**MTS Advantage™ Environmental Chamber**
- Temperature range of -129°C to 315°C (-200°F to 600°F)
- Designed for MTS Criterion systems
- Compatible with video extensometers

**EXTENSOMETRY OPTIONS**

**MTS Advantage Video Extensometer (AVX)**
- Temperature range of -100°C to 175°C (-150°F to 350°F)
- Repeatability strain measurement devices with quick attach fixture
- Ideal for measuring axial & transverse strain on specimens with rectangular cross sections

**MTS Contact Extensometers (Axial Model 634.31 & Transverse Model 632.10)**
- Delivers the highest quality in non-contact axial and cross-sectional strain measurement
- Multiple camera option to support strain averaging of opposite sides of the specimen
To simplify testing to ISO 527-5, MTS has developed a TestSuite TW test template that will set-up and run the recommended tensile tests. The templates support the use of strain gages or extensometers for strain measurement. Reports can display all of the required calculations including stress-strain plot, modulus of elasticity, stress at yield, strain at yield, tensile strength, strain at strength, stress at break, and strain at break, Poisson’s ratio, and more.

MTS consultants are also available to support any of your composite applications, test method set-up, and data collection and integration requirements.

---

**APPENDIX - TEST SPECIMEN DETAIL**

**Specimen Type A**

- Overall length: 250 mm
- Thickness: 1 mm
- Gauge length: 50 mm
- Initial distance between grips: 135 mm
- Length of end tabs: > 50 mm

**Specimen Type B**

- Overall length: 250 mm
- Thickness: 2 mm
- Gauge length: 50 mm
- Initial distance between grips: 135 mm
- Length of end tabs: > 50 mm

*Thickness of end tabs 0.5 to 2 mm*