

EN 2561 Tensile Properties Parallel to the Fibre Direction of Unidirectional Carbon Fibre-Reinforced Plastics

TEST METHOD SUMMARY

Tensile testing of unidirectional carbon fibre reinforced composites parallel to the fibre direction per EN 2561, 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. This standard only addresses unidirectional carbon fibre-reinforced composite materials with the axis parallel to the fibre direction.

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.

Solutions for EN 2561 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 carbon fibre-reinforced plastics per EN 2561.

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.



MTS Landmark®
 Servohydraulic Test Systems



MTS Criterion®
 Electromechanical Universal Test Systems


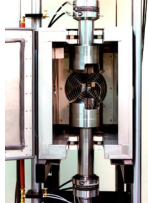
CHAMBER OPTIONS*

| | |
|---|---|
| | |
| <p>MTS Series 651 Environmental Chamber</p> | <p>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 |

EXTENSOMETRY OPTIONS*

| | |
|--|--|
| | |
| <p>MTS Advantage Video Extensometer (AVX)</p> | <p>MTS Contact Extensometers (Axial Model 634.31 & Transverse Model 632.18)</p> |
| <ul style="list-style-type: none"> » 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 | <ul style="list-style-type: none"> » Temperature range of -100°C to 175 °C (-150°F to 350°F) » Repeatable strain measurement devices with quick attach fixture » Ideal for measuring axial & transverse strain on specimens with rectangular cross sections |

GRIP OPTIONS*

| | |
|---|--|
|  |  |
| <p>Model 647 Side-Loading Hydraulic Wedge Grips</p> | <p>Model 647 All-Temperature Side-Loading Hydraulic Grips</p> |
| <ul style="list-style-type: none"> » Temperature range of -40°C to 175°C (-40°F to 350°F) » Stiff mounting ensures superior alignment capabilities and repeatable gripping to minimize bending strains » Tension, Compression & Fatigue capability » Adjustable gripping force to prevent slippage and squashing of the test specimen | <ul style="list-style-type: none"> » Temperature range of -130°C to 315°C or 540°C (200°F to 600°F or 1000°F) » Thermal gradients as low as 1.6°C (3°F) ensure reduced variability » Remotely operated grips support rapid specimen change without cooling for increased productivity |

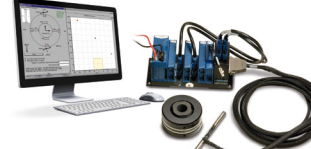
GRIP FACE OPTIONS*



Model 647 Grip Faces

- » Surfalloy incorporates a grit onto the wedge surface for firm gripping of composite specimen without tabs
- » Diamond-tipped for increased holding capacity of composite specimen with tabs
- » Water-cooled and extra wide options available

ALIGNMENT OPTIONS*

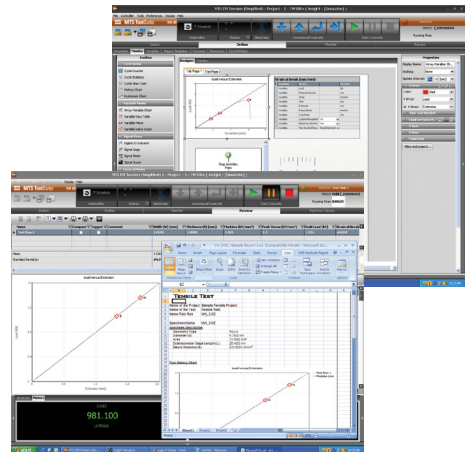


MTS Alignment Solutions

Specimen misalignment introduces data scatter, which forces the need to test larger batches of specimens and increases the operational cost. Both test systems can be equipped with stiff-mounted grips and an easy-to-implement load frame alignment solution to help drive test machine variability out of the material testing equation.

SOFTWARE OPTIONS*

| | |
|--|--|
| <p>EN 2561 Tensile Properties of Unidirectional Fibre Reinforced Plastic Composites Test Template</p> | <p>About MTS TestSuite™ TW</p> |
| <p>MTS has developed general composite tensile TestSuite TW test templates that can easily be modified to be in compliance with the EN 2561 requirements. 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.</p> <p>MTS consultants are also available to support any of 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>tw 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

| Specimen Type A | Specimen Type B | Specimen Type C |
|---|---|--|
| <p>Specimen Type A</p> <p>Overall length 250 mm</p> <p>Width 10 mm</p> <p>Thickness 2 mm</p> <p>Length of end tabs 65 ± 15 mm¹</p> <p>Initial distance between grips 136 mm</p> <p>¹ Thickness of end tabs 0.5 to 1 mm</p> | <p>Specimen Type B</p> <p>Overall length 250 mm</p> <p>Width 15 mm</p> <p>Thickness 1 mm</p> <p>Length of end tabs 65 ± 15 mm¹</p> <p>Initial distance between grips 136 mm</p> <p>¹ Thickness of end tabs 0.5 to 1 mm</p> | <p>Specimen Type C</p> <p>Overall length 250 mm</p> <p>Width 15 mm</p> <p>Thickness 1 mm</p> <p>Initial distance between grips 130 mm</p> |

MTS

MTS Systems Corporation
 14000 Technology Drive
 Eden Prairie, MN 55344-2290 USA
 Telephone: 1-952-937-4000
 Toll Free: 1-800-328-2255
 Fax: 1-952-937-4515
 E-mail: info@mts.com
 www.mts.com

ISO 9001 Certified QMS

MTS, MTS Criterion, SilentFlo, and MTS Landmark are registered trademarks, and MTS TestSuite and MTS Advantage are a trademarks of MTS Systems Corporation within the United States. These trademarks may be protected in other countries. RTM No. 211177. Surfalloy is a trademark of Alloying Surfaces Inc.

©2019 MTS Systems Corporation
 100-342-856b TMTN_EN2561 Printed in U.S.A. 01/19