

## EN 6031 Determination of In-Plane Shear Properties



MTS Landmark®  
Servohydraulic Test Systems

### TEST METHOD SUMMARY

The tensile test of a  $\pm 45^\circ$  laminate per EN 6031 is used to determine the in-plane shear response of fiber reinforced plastics. Uniaxial tensile force is applied to a flat test specimen up to failure to investigate the in-plane shear stress/strain response, and critical mechanical materials properties including shear modulus and shear strength. Composite materials addressed in this standard include laminates manufactured from unidirectional tape or fabrics, with the fibres oriented at  $\pm 45^\circ$  symmetrical to the main specimen axis.

The  $\pm 45^\circ$  in-plane shear 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 up to failure. The specimen response can be measured with a contacting or non-contacting extensometer or strain gages.

Solutions for EN 6031 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 EN 6031.

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 Criterion®  
Electromechanical Universal Test Systems

### CHAMBER OPTIONS\*

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

### EXTENSOMETRY OPTIONS\*

<b>MTS Advantage Video Extensometer (AVX)</b>	<b>MTS Contact Extensometer (Biaxial Model 632.85)</b>
<ul style="list-style-type: none"> <li>» Magnetic-return support arm for easy specimen access and precise positioning</li> <li>» Sixteen quick-attach measurement heads supporting a wide array of gage lengths and strain ranges</li> </ul>	<ul style="list-style-type: none"> <li>» Temperature range of -100°C to 150°C (-150°F to 300°F)</li> <li>» Measure axial averaging &amp; transverse strain with a single extensometer</li> <li>» Readily attach to many sizes of specimens</li> </ul>

**GRIP OPTIONS\***

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

**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\***

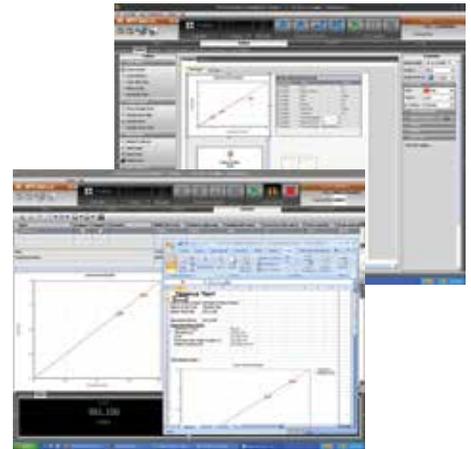


**MTS Alignment Solutions**

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.

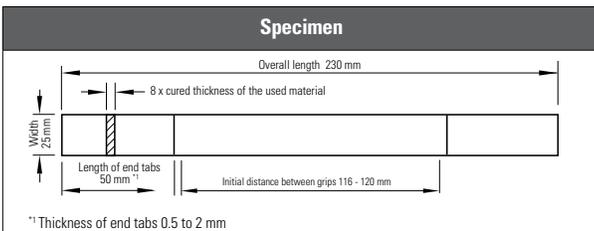
**SOFTWARE OPTIONS\***

<p><b>EN 6031 Determination of In-Plane Shear Properties Test Template</b></p>	<p><b>About MTS TestSuite™ TW</b></p>
<p>MTS has developed general tensile ± 45° in-plane shear test TestSuite TW test templates that can easily be modified to be in compliance with the EN 6031 requirements. The templates support the use of strain gages or extensometers for strain measurement. Reports can display all of the required calculations including in-plane shear stress / strain plot, shear modulus and shear strength.</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><b>twc</b> 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><b>twx</b> 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**



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