

ASTM E290 Bend Testing of Material for Ductility

TEST METHOD SUMMARY

The standards covers bend testing of material for ductility under different boundary conditions. One of the more common is the guided-bend test, that uses a 3-point bend setup without using a female die.

The bend test is performed by placing either a rectangular or round specimen symmetrically on the support fixture that is mounted to the testing machine. The load is applied to the specimen at mid-span until either failure occurs, or until the predefined angle of bend, or maximum angle for the fixture is achieved. The angle of bend is determined while the specimen is under bending load, by the projection of lines with the flat surfaces of the specimen outside of the bend region and is the intersecting angle of these lines. After the bending test is completed, the curved surface of the bend is examined for evidence of a crack or surface irregularities to determine if the material has failed.

Please refer to the standard for more detailed information about the other test setups; guided U-bend or V-bend; semi-guided bend; free-bend; bend and flatten.

Solutions for ASTM E290 guided-bend test typically include these types of components:

LOAD FRAME OPTIONS*

MTS offers electromechanical Criterion® and Exceed® universal test systems and dynamic servohydraulic Landmark® test systems that are ideal for performing accurate and repeatable monotonic bend testing of metallic materials per ASTM E290.

MTS Criterion universal testing systems are engineered to support the needs of advanced Research & Development. MTS Exceed universal testing systems are best suited for Quality Control testing by delivering the reliable performance needed to meet the uptime demands of high-volume production environments. Due to the large variety of metals and specimen dimensions that can be tested per ASTM E290, the required force capacities can differ significantly. MTS offers frame models that address the smaller force requirements for testing thin-sheet specimens up to high-force requirements for testing thick plate type specimens.

The MTS Criterion and the MTS Exceed universal testing machines range from tabletop to floor-standing electromechanical models with force ratings of up to 600 kN / 135 kip. Many of the models have dual-zone test spaces to reduce set-up times if you frequently change test requirements.

The MTS Landmark dynamic servohydraulic test system with its superior stiffness and alignment capabilities, is an ideal choice if additional fatigue and fracture testing capabilities are required. Systems are available in highly configurable floor-standing and tabletop models with force ratings from 5 kN / 1 kip to 500 kN / 110 kip.

As an alternative to a new load frame, you can replace outdated controls / hydraulics of existing MTS or another manufacturer's electromechanical, servohydraulic or custom test systems, including:

**Instron®, **Zwick®, **Tinius Olsen™, **SATEC®, **Baldwin® and more with an MTS ReNew™ Upgrade.

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MTS Criterion® & MTS Exceed®
Electromechanical Universal Test Systems







MTS Landmark®
Servohydraulic Test Systems



MTS ReNew™
Upgrade for Hydraulic & Electromechanical Test Systems

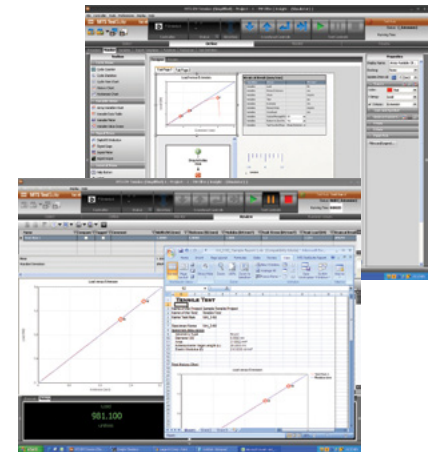
FIXTURE OPTIONS*

The lower support span and the radius of the supports and loading nose are generally selected based on the material and specimen type to be tested. Applicable product specifications define the distance between the supports and radius requirements as related to the specimen thickness to be tested. For example, a hot rolled mild steel sheet or soft aluminum might require only a radius of 1.5 to 3 times the thickness, but high strength steel or hard aluminum alloys with low ductility can require a radius as large as 5 to 8 times the thickness.

			
Ambient Temperature Testing		Non-ambient Temperature Testing	
<p>» Bend fixtures have adjustable spans with easy-to-use, permanently attached scales for equal positioning of the rollers</p> <p>» Hardened rollers ensure test result accuracy by reducing undesirable loading and frictional forces on the specimen</p>			

SOFTWARE & CONSULTING OPTIONS*

About MTS TestSuite™ TW	ASTM E290 Bend Testing of Material for Ductility Test Method Template
<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 and can be used without fear of inadvertently modifying the Test Method. 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>	<p>To simplify testing to ASTM E290, MTS has developed a TestSuite TW test method template that will set-up and run the recommended guided-bend tests.</p> <ul style="list-style-type: none"> » Crosshead/actuator can be used for displacement measurement and control » Post-test review tab and reports show data in load-displacement plots and highlight values such as angle of bend, maximum load, and more » Raw data can be exported in many formats including CSV and TXT » Test methods, calculations, review displays, and report layouts can be customized by the user

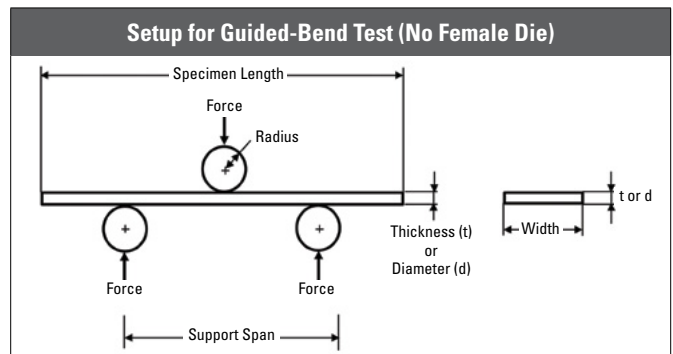


MTS Consulting Can Enable LIMS Integration & Other Lab Efficiency Enhancements
<p>MTS consultants are available to support seamless data integration from your TestSuite test templates to your laboratory information management system (LIMS). Lab Efficiency Enhancements could include:</p> <ul style="list-style-type: none"> » Integrating bar code scanners, reading data from micrometers and calipers, capturing video via webcam » Automating the interface of two-way communications between TestSuite and virtually any LIMS system

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

APPENDIX - TEST SPECIMEN DETAIL

ASTM E290 supports rectangular or round specimens of full-cross-sections or full-thickness. The specimen thickness shall be of the thickness of the material. The width to thickness ratio should be 2:1 with a minimum width of at least 18 mm (3/4 in.) or at least 8:1 or greater for thin sheet materials. The length of the specimen must be sufficient to permit bending to the required angle. Please consult ASTM E290 for more detailed information about the supported specimen geometries.



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