

ASTM A370 Mechanical Testing of Steel Products - *Bend*

With Guidance from ASTM E190 (Welds) & E290 (Materials)

TECHNOTES for ASTM A370 Tension, Bolt & Round Wire Tension are also available.



MTS Criterion® & MTS Exceed®
Electromechanical Universal Test Systems



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TEST METHOD SUMMARY

ASTM A370 defines test methods and definitions for mechanical testing of steel products. The standard references ASTM E190 and E290 for the test methods.

ASTM E190 covers guided bend testing of welds for the determination of reliability and ductility in ferrous and nonferrous products. The guided bend test is performed by placing a rectangular specimen symmetrically on the U-shaped support fixture that is mounted to the testing machine. The load is applied to the weldment of the flat specimen at mid-span until the specimen conforms to a U-shape, or until failure occurs.

ASTM E290 covers bend testing of material for ductility under different boundary conditions. Two of the more common are the guided 3-point and U-shaped bend tests. The bend test is performed by placing a 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 / maximum angle for the fixture or the U-shape is achieved.

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 ASTM E290 for more detailed information about the other test setups; guided V-bend; semi-guided bend; free-bend; bend and flatten.

Solutions for ASTM A370, E190 & 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 A370, E190 & 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.

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 static-hydraulic, electromechanical, servohydraulic or custom test systems, including: **Instron®, **Zwick®, **Tinius Olsen™, **SATEC®, **Baldwin® and more with an MTS ReNew™ Upgrade.

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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.

	
<p>U-Shape Bend Fixture (Welds & Materials)</p>	<p>3-Point Bend Fixture (Materials Only)</p>
<ul style="list-style-type: none"> » Fixture consists of a plunger to be attached to the crosshead and an adjustable bearing jig to attach to the bottom of the test machine » Bearing jig can be adjusted and the plunger can be replaced to accommodate test setup requirements for different specimen dimensions » Meets ASTM E190 & ASTM E290 requirements 	<ul style="list-style-type: none"> » Bend fixtures have adjustable spans with easy-to-use, permanently attached scales for equal positioning of the rollers » Hardened rollers ensure test result accuracy by reducing undesirable loading and frictional forces on the specimen » Meets ASTM E290 requirements

SOFTWARE & CONSULTING OPTIONS*

<p>About MTS TestSuite™ TW</p>	<p>ASTM A370 Bend Testing Test Method Template</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 methods 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 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 bend testing to ASTM A370, 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



<p>MTS Consulting Can Enable LIMS Integration & Other Lab Efficiency Enhancements</p>
<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 A370 / ASTM E290 (Materials) uses rectangular or round specimens while ASTM A370 / ASTM E190 (Welds) use only rectangular specimens. Please consult the standards for details.



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